PLANMECA

Planmeca Compact^{i}

TECHNICAL MANUAL

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Chapter I DIAGRAMS

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Chapter

A

GENERAL & TECHNICAL DATA

1 WARNINGS AND CAUTIONS

WARNING

The unit contains live mains voltage parts. Always first turn off externally the power to the unit before attempting to service the lift-motor, backrest motor, or any parts inside the electronics control box.

Turning off the unit from its own mains switch DOES NOT cut off the mains voltage from all internal nodes.

NOTE ***ELECTRICAL SAFETY***
Always replace the fuses with ones of the same type and rating. Otherwise patient, operator or equipment safety cannot be guaranteed. Please see fuse label on left side of control box for fuse ratings.

CIRCUIT BOARDS
The circuit boards in the unit can be damaged by static electricity and require special handling and antistatic packaging materials to be used both during handling and shipping. See page A-6 for handling details.

NOTE ***GENERAL SAFETY***
The unit must be serviced by qualified personnel only, trained by PLANMECA or approved dealers. Repairs and parts replaced by unqualified personnel carry no warranty.

Periodic maintenance as described in this manual must be performed on a regular basis.

2 MANUAL VERSIONS

Planmeca pursues a policy of continual product development. Although every effort is made to produce up-to-date product documentation this publication should not be regarded as an infallible guide to current specifications. We reserve the right to make changes without prior notice.

NOTE ***This manual is only valid for the Main Control PCB software versions from 2.84 and later.***

The installed software revision determines the available functions and behaviour of the unit. If the unit is reporting error or help messages not listed in this manual, please refer to a newer revision of the manual.

If you find service modes described in this manual that does not exist in the unit, please update the unit software to the latest version.

3 TECHNICAL SPECIFICATIONS

Original manufacturer

PLANMECA Oy, Asentajankatu 6, 00880 Helsinki, FINLAND
phone: +35 20 77950 500, fax: +358 20 7795 555, www.planmeca.com

Colours

Painted parts:	RAL-9016
Upholstery colours:	please consult your dealer for availability

Mechanical dimensions

Installed:	(H x D x W) 1210mmx963mmx1990mm (see template for details)

Weight

≈130 kg (287 lbs)

Temperatures and Humidity

Operating:	+15°C to +35°C, non condensing humidity from 20% to 75%
Storage:	0°C to +50°C, non condensing humidity from 20% to 75%

Mains voltage and frequency

Mains voltage	100 VAC 115 VAC 220-240 VAC
Mains frequency	50 or 60 Hz

Power consumption

Idle unit:	≤ 250VA (unit not in use, OP-light turned on)
Typical average:	≈ 350 VA (during patient treatment)
Maximum:	≥ 1200 VA (at maximum rated mains voltage, both chair motors running)

Water supply

Pressure range:	min. 300kPa (45 psi), max. 900 kPa (130 psi)
Flow rate:	≤ 4 l/ min (maximum consumption at any instance)
Quality:	hardness; ≤ 8 °dH (1°dH= 20mg Ca/ 3 liter water)
Connection:	1/4”

Air supply

Pressure range:	min. 550 kPa (80 psi), max. 900 kPa (130 psi)
Flow rate:	≥ 55 litres / minute (maximum consumption at any instance)
Air quality:	medical grade, dry and oil-free
Connection:	1/4”

Suction connection

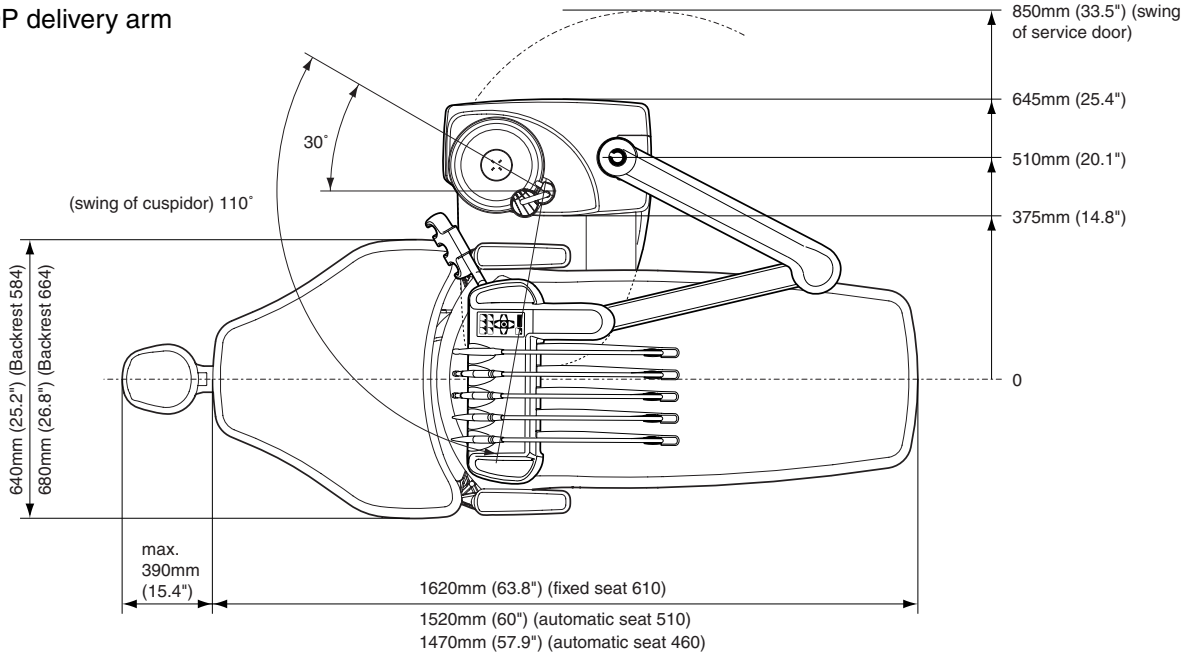
Vacuum:	≥ 150 mbar
Flow rate:	≥ 550 l/ min
Connection:	25 mm (3/4”)

Drain connection

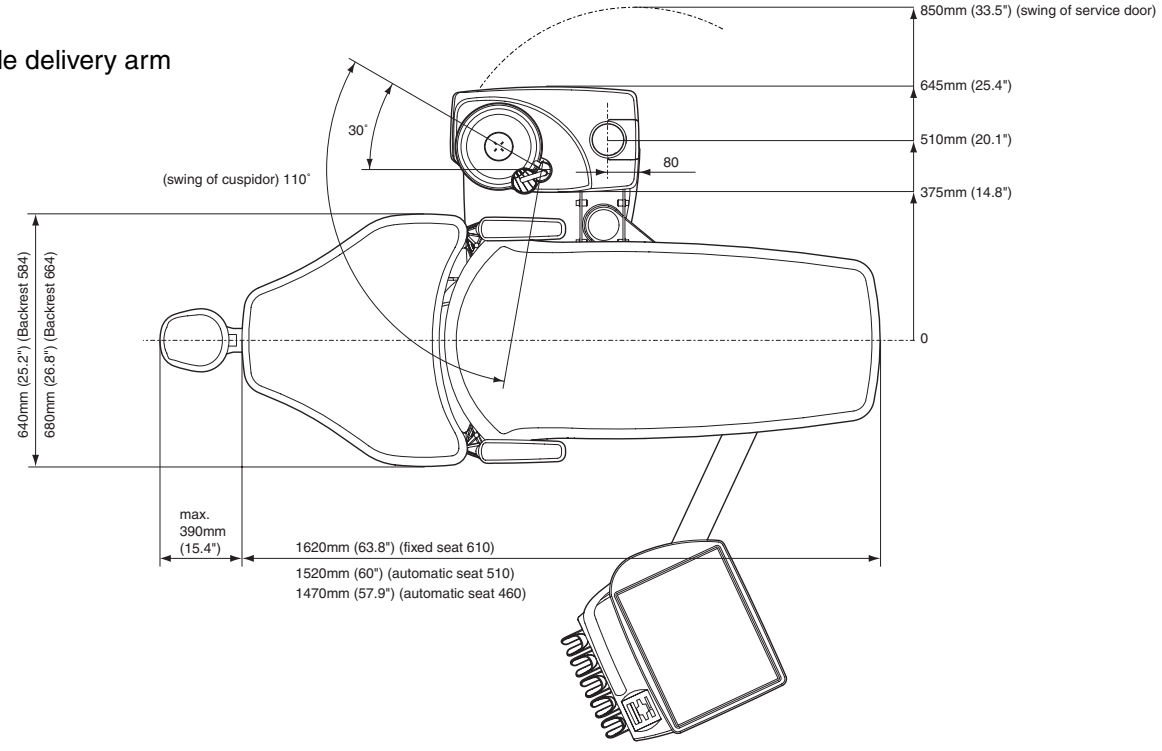
Capacity:	min. 10 l/min
Connection:	25 mm (3/4”)

Dimensions

OP delivery arm



Side delivery arm



4 LIST OF TERMS AND ABBREVIATIONS IN THIS MANUAL

Some frequently used names and parts are abbreviated. The following is a list of the used abbreviations and their brief explanations.

CPU	Central Processing Unit, the microprocessor chip that executes the software program.
ECB	Electronics Control Box. The black-anodized box inside the unit that contains the MCB and other electrical parts.
EEPROM	Electrically Erasable Programmable Read Only Memory.
EPROM	Electrically Programmable Read Only Memory.
Flash-EPROM	EPROM that can be reprogrammed in the socket without the need to remove the chip from the PCB.
IMUX	Instrument MUltipleXer. The device in the console that selects and feeds the instruments with power and pressures. Consists of the valve block cluster and two PCB's.
IPS	Instrument Power Supply (Universal Power Supply located on the MCB, feeding micromotors, polymerization light bulbs and the scaler electronics).
kPa	kiloPascal, pressure indicator 100kPa = 1bar = 13 PSI
LED	Light Emitting Diode, used as indicator lamps and displays.
LCH	Light Curing Handpiece (Polymerization light).
MCB	Main Control Board. The PCB inside the cuspidor in the "black box". This is the "main brain" that controls the whole unit.
na	not applicable.
RAM	Random Access Memory.
STH	Suction Tube Holder.
tba	to be announced.
PCB	Printed Circuit Board.
PSB	Pressure Sensor Board.
PSI	Pounds per Square Inch.
QC	Quick Connector. The connector at the hose end that connects to the instrument console IMUX.

5 HANDLING PRECAUTIONS FOR PCB'S AND SOFTWARE CHIPS

5.1 Handling printed circuit boards

The circuit boards are well protected against static discharges when they are in the unit. However, some precautions are necessary when handling the boards since some internal nodes can easily be damaged by static electricity.This is true especially during low humidity conditions when there is evidently a potential risk of static discharges.

Keeping these few simple rules in mind when handling PCBs or software chips can make a big difference;

- Grounding wrist-straps are not necessarily required when handling the boards, as long as you first always touch a grounded exposed metal part in the unit before touching the PCB.
- Place the removed PCB immediately in an antistatic plastic bag. This protects it from later improper handling. Please note that PCB's for warranty replacement must be returned to the factory properly packaged in antistatic plastic bags.
- Never place a removed PCB on a conductive surface or handle it to another person, without touching the surface or person first.

5.2 Handling software Flash-EPROM chips

To avoid static discharge problems the same rules that apply for PCB's should be followed when handling software Flash-EPROM chips.

Software Flash-EPROM chips must be stored in their specific anti-static plastic tubes, protecting them also mechanically.

Since the software chip used is a PLCC-type chip, it must be removed only with a proper extracting tool (see the spare part manual for details). Using any other tool for removal can seriously damage the socket on the MCB.

Please refer to 5.1 "How to replace/upgrade the software" on page G-16 for details how to replace the software.

6 EMC INFORMATION

WARNING

Use of any accessories and cables other than those specified in Planmeca Compact i dental unit's documentation, with exception of cables sold by Planmeca as replacement parts for internal components, may result in increased emission or decreased immunity of the dental unit.

WARNING

Planmeca Compact i dental unit should not be used adjacent to or stacked with other equipment. If adjacent or stacked use is necessary, the Planmeca Compact i dental unit should be observed to verify normal operation in configuration which it will be used.

Guidance and manufacturer's declaration - electromagnetic emissions		
Planmeca Compact i dental unit is intended for use in the electromagnetic environment specified below. The customer or the user of the Planmeca Compact i dental unit should assure that it is used in such an environment.		
Emissions test	**Compliance**	**Electromagnetic environment – guidance**
RF emissions CISPR 11	Group 1	Planmeca Compact i dental unit uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class B	Planmeca Compact i dental unit is suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Class A	
Voltage fluctuations/ flicker emissions IEC 61000-3-3	Complies	

Guidance and manufacturer's declaration - electromagnetic immunity			
Planmeca Compact i dental unit is intended for use in the electromagnetic environment specified below. The customer or the user of Planmeca Compact i dental unit should assure that it is used in such an environment.			
Immunity test	**IEC 60601 test level**	**Compliance level**	**Electromagnetic environment-guidance**
Electrostatic discharge (ESD) IEC 61000-4-2	±6 kV contact ±8 kV air	±6 kV contact ±8 kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst IEC 61000-4-4	±2 kV for power supply lines ±1 kV for input/output lines	±2 kV for power supply lines ±1 kV for input/output lines	Mains power quality should be that of a typical commercial or hospital environment
Surge IEC 61000-4-5	±1 kV line to line ±2 kV line to earth	±1 kV line to line ±2 kV line to earth	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	<5 % U_T (>95 % dip in U_T) for 0,5 cycle 40 % U_T (60 % dip in U_T) for 5 cycles 70 % U_T (30 % dip in U_T) for 25 cycles <5 % U_T (>95 % dip in U_T) for 5 s	<5 % U_T (>95 % dip in U_T) for 0,5 cycle 40 % U_T (60 % dip in U_T) for 5 cycles 70 % U_T (30 % dip in U_T) for 25 cycles <5 % U_T (>95 % dip in U_T) for 5 s	Mains power quality should be that of a typical commercial or hospital environment. If the user of Planmeca Compact i dental unit requires continued operation during power mains interruptions, it is recommended that Planmeca Compact i dental unit be powered from an uninterruptible power supply.
Power frequency(50/60 Hz) magnetic field IEC 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment. The power frequency magnetic field should be measured in the intended installation location to assure that it is sufficiently low.
NOTE U_T is the a.c. mains voltage prior to application of the test level.			

Guidance and manufacturer's declaration - electromagnetic immunity			
Planmeca Compact i dental unit is intended for use in the electromagnetic environment specified below. The customer or the user of Planmeca Compact i dental unit should assure that it is used in such an environment.			
Immunity test	**IEC 60601 test level**	**Compliance level**	**Electromagnetic environment-guidance**
Conducted RF IEC 61000-4-6	3 Vrms 150 kHz to 80 MHz	3 Vrms	Portable and mobile RF communications equipment should be used no closer to any part of the Planmeca Compact i dental unit, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. **Recommended separation distance** $\mathbf{d} = 1.2\sqrt{P}$
Radiated RF IEC 61000-4-3	3 V/m 80 MHz to 2.5 GHz	3 V/m	$\mathbf{d} = 1.2\sqrt{P}$ 80 MHz to 800 MHz $\mathbf{d} = 2.3\sqrt{P}$ 800 MHz to 2.5 GHz where **P** is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and **d** is the recommended separation distance in metres (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey,[a] should be less than the compliance level in each frequency range.[b] Interference may occur in the vicinity of equipment marked with the following symbol:
NOTE 1: At 80 MHz and 800 MHz, the higher frequency range applies. NOTE 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.			
[a] Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which Planmeca Compact i dental unit is used exceeds the applicable RF compliance level above, Planmeca Compact i dental unit should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating Planmeca Compact i dental unit. [b] Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.			

Recommended separation distances between portable and mobile RF communications equipment and Planmeca Compact i dental unit

Planmeca Compact i dental unit is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of Planmeca Compact i dental unit can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the Planmeca Compact i dental unit as recommended below, according to the maximum output power of the communications equipment.

Rated maximum output power of transmitter **W**	**Separation distance according to frequency of transmitter** **m**		
	150 kHz to 80 MHz $\mathbf{d} = 1.2\sqrt{P}$	**80 MHz to 800 MHz** $\mathbf{d} = 1.2\sqrt{P}$	**800 MHz to 2.5 GHz** $\mathbf{d} = 2.3\sqrt{P}$
0.01	0.2	0.2	0.3
0.1	0.4	0.4	0.7
1	1.2	1.2	2.4
10	4.0	4.0	8.0
100	12.0	12.0	24.0

Chapter

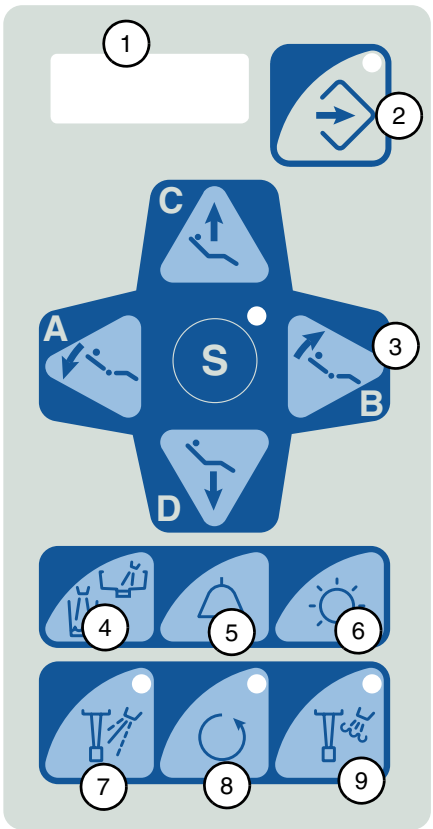
B

CONTROL PANEL FUNCTIONS

1 CONTROL PANEL OVERVIEW

NOTE ***For units equipped with the Plus package refer to the Planmeca Compact i User's Manual.***

This chapter describes the control panel functions in normal and service modes. There are some special control and display modes that are not normally available but which can be entered by certain key sequences. In the following it is explained what operations can be achieved with the keys and which indications appear on the display.



(1) Multi-purpose Display;
- "PCI" -text displayed when unit is idle
- instrument speed or power
- polymerization light curing time
- help and error messages
- instrument settings in program mode
- other unit settings in program mode
- service mode information

(2) Program mode key and indicator light

(3) Patient chair control keys;
- A - backrest down / go to position A
- B - backrest up / go to position B
- C - seat up / go to position C
- D - seat down / go to position D
- S - run to / return from spittoon position

(4) Bowl rinse/glass fill key
(5) Extra function key (door open / nurse call etc.)
(6) Operating light control key
(7) Instrument spray key and indicator light
(8) Micromotor reverse key and indicator light
(9) Automatic chip-blow key and indicator light

2 NORMAL USER FUNCTIONS

The control panel is always in the normal operating mode when the unit is switched on. Please refer to the Planmeca Compact i User's Manual for descriptions for the normal control panel operation and instructions for normal everyday use of the unit.

3 USER PROGRAMMING MODE

There are several adjustments the user can perform to fulfil individual needs by using the user programming mode.

All user programming follows the same pattern:

a) Press the program key to activate the programming mode. The indicator light will come on.

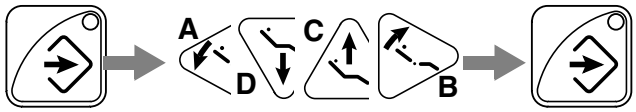
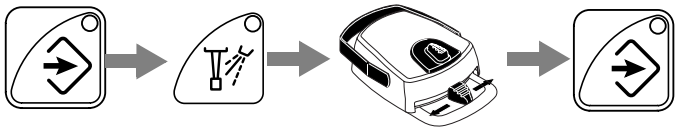
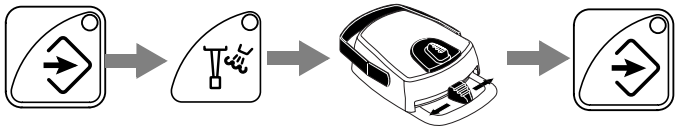
b) Select the desired function from the control panel.

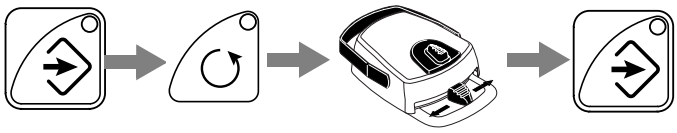
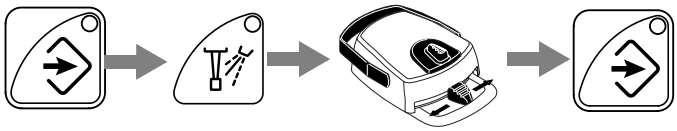
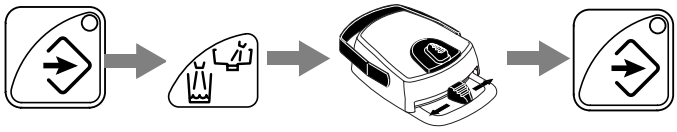
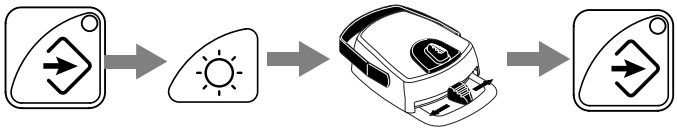
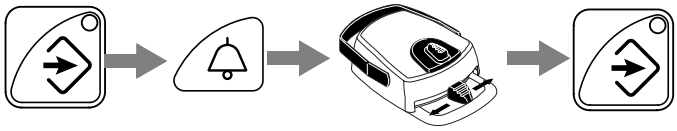
c) Change the setting of the function with the foot control. Push the pedal halfway right to increase the parameter value and halfway left to decrease it. If the pedal is pushed more than 0.4 sec., the value will change as long as the pedal is pushed.

d) Press the program key to store the new setting into the memory. The indicator light will go out.

e) When programming instrument settings; remove the instrument that you wish to program from its holder. After identifying the instrument it can be either held out from or returned to its holder. If returned you have 3 seconds time to enter the programming mode.

NOTE ***The maximum air and water flow rate of the syringe can not be changed via the keyboard controls. However, there are screwdriver-adjustable valves inside the console that can be adjusted if desired. Please refer to 3.2 "Adjusting syringe water and air flow rates" on page F-24.***

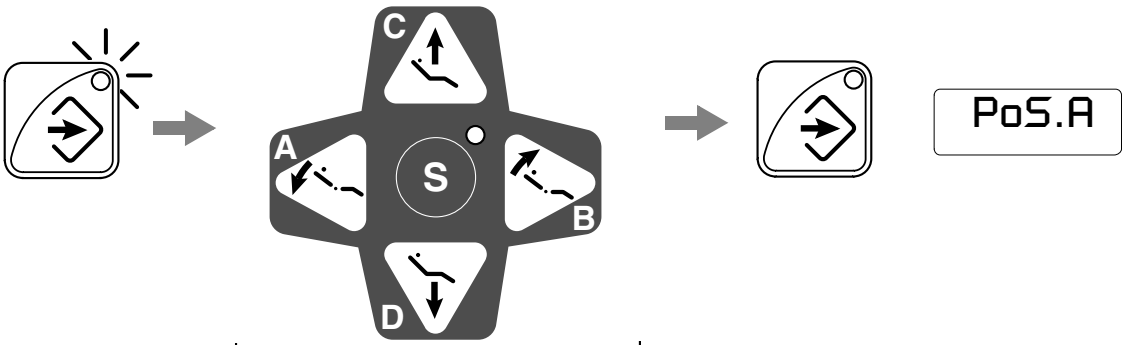
FUNCTION	KEY SEQUENCE	FOR DETAILS REFER TO
Programming chair automatic positions		4.1 "Automatic chair positions" on page B-4
Adjusting spray water and air flow on selected instrument		4.2 "Instrument spray flow rates" on page B-4
Adjusting chip blow air and water flow on selected instrument		4.3 "Chip blow flow rates" on page B-5

FUNCTION	KEY SEQUENCE	FOR DETAILS REFER TO
Adjusting fibre light intensity on selected instrument		4.4 “Fibre optic light intensity” on page B-6
Selecting exposure time on selected polymerization light		4.5 “Polymerization light exposure time” on page B-6
Adjusting bowl rinse and glass fill times		4.6 “Duration of the bowl rinsing and duration of the glass filling” on page B-7
Adjusting operating light intensity	 Alternative method: press and hold	4.7 “Intensity of the operating light” on page B-8
Adjusting extra function (door/ nurse) signal duration		4.8 “Duration of the extra function relay activation” on page B-8

4 PROGRAMMING MODE FUNCTION DETAILS

4.1 Automatic chair positions

The chair must be in the desired position to be programmed before entering the programming mode. If not, please first move the chair to the position required using the chair foot control or the chair keys on the unit control panel.



a) Press the program key.

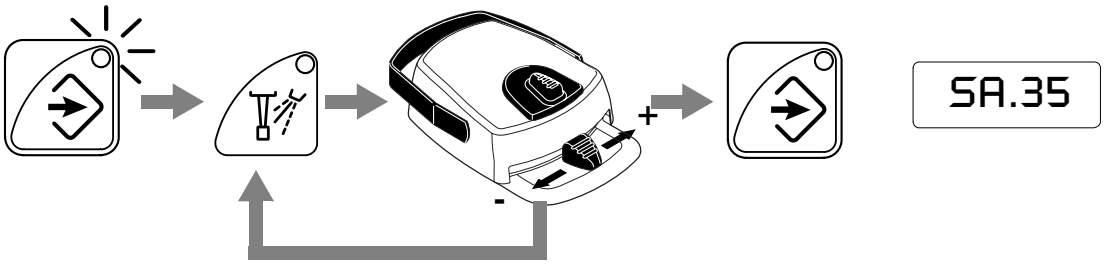
b) Press the desired chair position key where to store the chair's position (S, A, B, C or D). Switch the operating light on or off for this position. Note that if you are programming the spittoon position, you can not select the operating light setting.

c) The text 'PoS.n' will appear on the display (n can then be either A, b, C, d or S).

d) Press the program key to store the chair position into the memory. The indicator light will go out.

4.2 Instrument spray flow rates

Since the adjustment is individual for each instrument, you must indicate which instrument to program by picking it out from the holder.



a) Press the program key.

b) Press the instrument spray key. The text 'SA.nn' or 'SH.nn' will appear on the display indicating which of the parameters will be adjusted (A for air and H for water).

c) Press the spray key repeatedly (or the foot control pedal briefly down) to toggle between air and water adjustment.

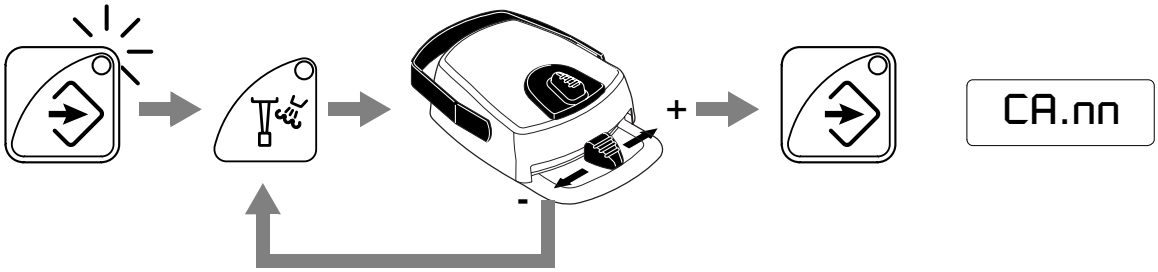
d) Change the flow rate with the help of the foot control pedal. Bringing the pedal to the right will increase the flow, taking it to the left side will decrease the flow. Please note that the instrument will run normally during this operation. Turbines will start immediately to full speed.

e) Press the program key to exit and store the new spray settings.

NOTE ***If the dental unit is equipped with the Planmeca Sterile Water System, the sterile water function is selected in this mode. Letters 'St' indicate that sterilized water is fed to the selected instrument. The indicator light of the instrument spray key flashes when the spray is on. For more information, refer to the Sterile Water System User's Manual.***

4.3 Chip blow flow rates

Since the adjustment is individual for each instrument, you must indicate which instrument to program by picking it out from the holder.



a) Press the program key.

b) Press the chip blow key. The text 'CA.nn' or 'CH.nn' will appear on the display indicating which of the parameters will be adjusted (A for air and H for water). The factory setting is full air pressure and water off.

c) Press the chip blow key repeatedly (or the foot control pedal briefly down) to toggle between air and water adjustment.

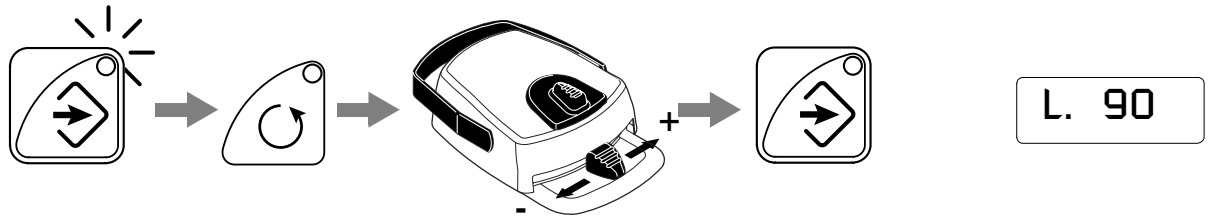
d) Change the flow rate with the help of the foot control pedal. Bringing the pedal to the right will increase the flow, taking it to the left side will decrease the flow. Please note that the instrument will not run during this programming operation.

e) Press the program key to exit and store the new automatic chip blow settings.

NOTE ***The manual chip blow is set as default to be dry (air only), independent of the automatic chip blow programming. However, if desired, this can be altered, please refer to "n.43 Set mode of foot controlled chip-blow (n range = 0,1)" on page C-23.***

4.4 Fibre optic light intensity

Since the adjustment is individual for each instrument, you must indicate which instrument to program by picking it out from the holder. Obviously this mode is valid only for instruments that can be equipped with a fibre light.



a) Press the program key.

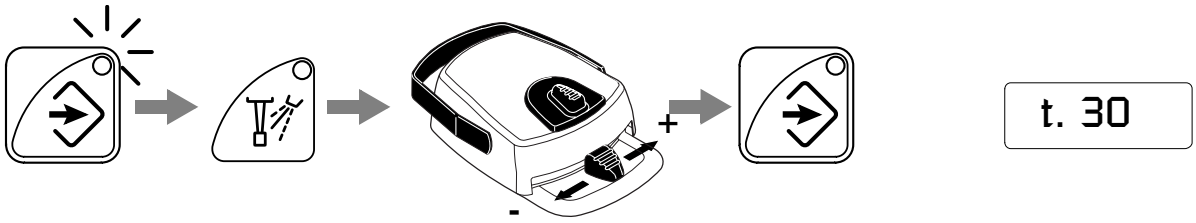
b) Press the reverse rotation key. The text ‘L. nn’ or ‘L. oFF’ will appear on the display.

c) Change the light intensity with the help of the foot control pedal. Bringing the pedal to the right will increase the light, taking it to the left side will decrease the light. Please note that the instrument will not run during this programming operation. The light can be programmed to be always off: after reaching the minimum value the light is switched off, indicated by ‘L.oFF’ on the display.

d) Press the program key to exit and store the new light intensity into the memory.

4.5 Polymerization light exposure time

Since the adjustment is individual for each curing light, you must indicate which instrument to program by picking it out from the holder.



a) Press the program key.

b) Press the instrument spray key. The text ‘t. nn’ will appear on the display, nn indicates the current exposure time in seconds.

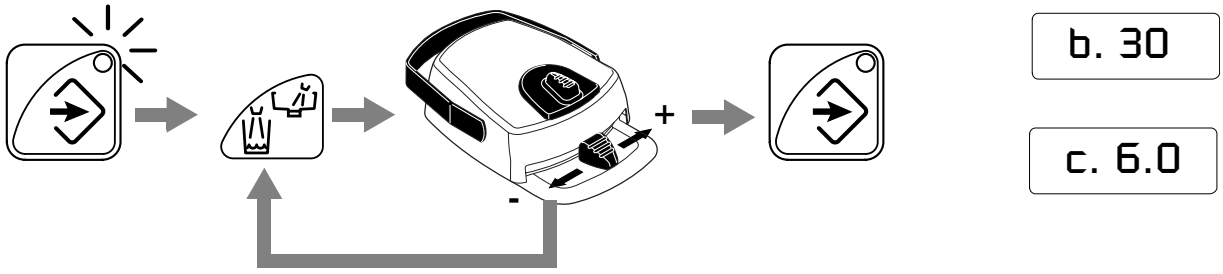
c) Change the exposure time with the help of the foot control pedal. Bringing the pedal to the right will increase the time, taking it to the left side will decrease the time. The interval is 5 seconds. Please note that the curing light does not start during the programming.

d) Press the program key to exit and store the new setting.

NOTE ***The recommended exposure times (factory settings) for various lights are as follows, and should not be set shorter than indicated to guarantee a good curing effect;***

Demetron	30 seconds
Lysta	40 seconds.

4.6 Duration of the bowl rinsing and duration of the glass filling



a) Press the program key.

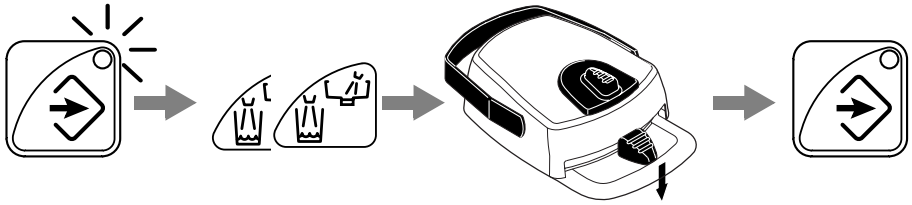
b) Press the bowl rinse/glass fill key. Press it repeatedly to toggle between bowl rinsing and cup filling times. The text ‘b.nnn’ indicates bowl rinse time, the text ‘c.nn.n’ indicates cup filling time.

c) Change the duration with the help of the foot control pedal. Bringing the pedal to the right increases the time, taking it to the left side will decrease the time.

d) The minimum value of the bowl rinsing is 5 sec. and the maximum 240 sec., and the adjustment step is 5 seconds. The minimum value of the glass filling is 2 sec. and the maximum 10 sec., and the adjustment step is 0.5 seconds.

e) Press the program key.

NOTE ***The duration of the glass filling can alternatively be programmed as follows:***



a) Place an empty glass to the glass holder.

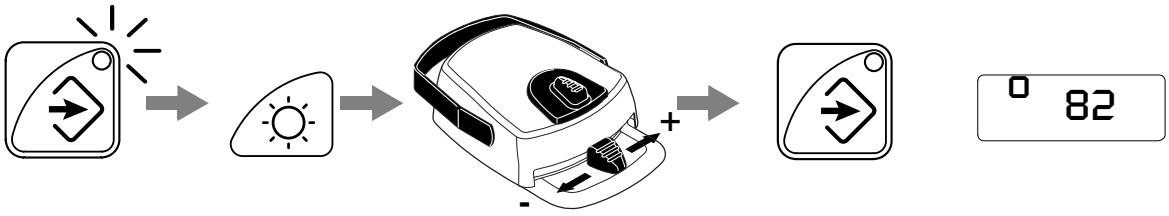
b) Press the program key.

c) Press the bowl rinse/glass fill key twice. The text ‘c.nn.n’ will appear on the display.

d) Push and hold the foot control pedal down. The glass filling time will first be set to 2 seconds and will start to increase after 2 seconds. The pedal can be released and then pushed again, and the time continues to increase.

e) Press the program key to exit and store the new setting.

4.7 Intensity of the operating light



a) Press the program key.

b) Press the operating light key. The text ‘o nnn’ will appear on the display.

c) Change the intensity with the help of the foot control pedal. Bringing the pedal to the right increases the intensity, taking it to the left side will decrease the intensity.

d) The minimum value is 70% of the maximum intensity and the maximum 100%, and the adjustment step is 2.

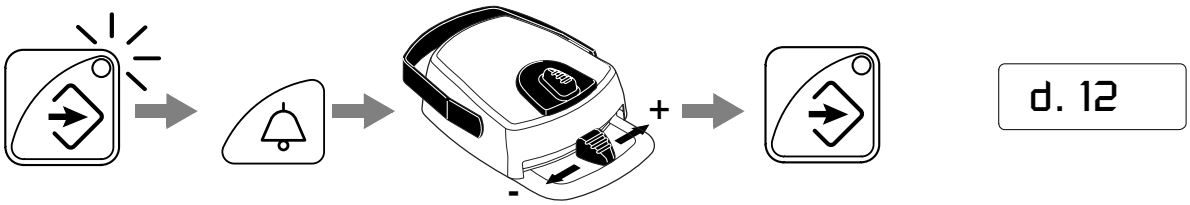
e) Press the program key to exit and store the new setting.

NOTE ***The intensity of the operating light can also be programmed as follows:***

Press and hold the operating light key (or the button in the light handle) for longer than 0,5 seconds. As long as the button is pressed, the light intensity slowly decreases (or increases) until it comes to the minimum (or maximum) value. A short beep sounds at the end limit. The adjustment direction is automatically toggled each time the button is released.

Both methods have the same effect when adjusting the brightness of the operating light. However, the former is implemented only for the sake of symmetry of the functions, the later method being the easier to use.

4.8 Duration of the extra function relay activation



a) Press the program key.

b) Press the extra function key. The text ‘d.nnn’ will appear on the display.

c) Change the door open/nurse call time with the foot control. The minimum value is 0 sec. and the maximum 25 sec., and the adjustment step is 0.5 seconds.

d) Press the program key.

Chapter

C

SERVICE MODE

CAUTION ***Some of the service mode functions can be used to alter the operation of the unit. Never use service modes that you are not familiar with how they operate.***

CAUTION ***The chair lift mechanism can be driven at any time (even if the service door is open) in the service mode. Make sure to remove tools and fingers from the mechanism prior to running the chair from its controls.***

1 GENERAL ABOUT THE SERVICE MODE

The service mode is intended to assist the technician in the service and setup of the unit:

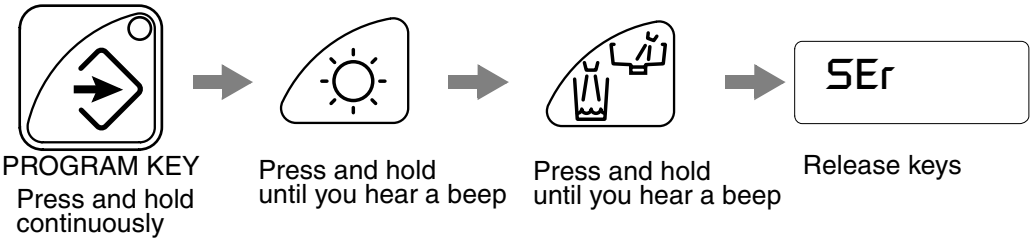
- display of all internal signals from sensors and switches
- display of internal voltages and other variables
- display of output and control signals
- adjustment of unit's parameters
- preset of all the parameters to the factory default

The service mode is entered using a special key sequence. The entry has been made difficult on purpose to prevent accidental entry. The numeric display and the chair control keys change meaning in the service mode. The rest of the keys and the unit work normally.

NOTE ***The user display is replaced with service mode information, and no error or help codes are displayed in the service mode.***

NOTE ***Even if listed in this documentation, some service modes are reserved for future use and might not yet be implemented in the current software version.***

1.1 How to enter service mode


SEr
PROGRAM KEY
Press and hold continuously
Press and hold until you hear a beep
Press and hold until you hear a beep
Release keys

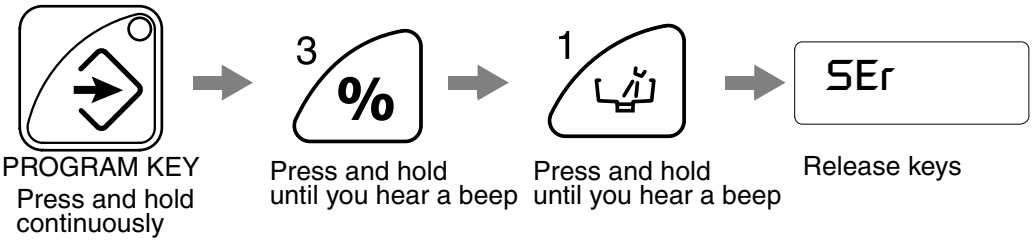
a) Press the program key and **hold it down**.

b) Press the operating light key until you hear a beep (approx. 2 seconds).

c) Then press the bowl rinse/glass fill key until you hear a beep (approx. 2 seconds).

d) Release both keys (program key & bowl rinse/glass fill key). The display briefly shows “SEr” when service mode is entered.
The number of the latest used service mode will then be shown on the display. After 1 second it will be replaced with the current setting or value of this service mode.

Units equipped with Plus package:



a) Press the program key and **hold it down.**

b) Press the instrument power reduction key until you hear a beep (approx. 2 seconds).

c) Then press the bowl rinse key until you hear a beep (approx. 2 seconds).

d) Release both keys (program key & bowl rinse key). The display briefly shows “SEr” when service mode is entered.
The number of the latest used service mode will then be shown on the display. After 1 second it will be replaced with the current setting or value of this service mode.

NOTE ***If the unit is equipped with the Dürr amalgam separating system or Dürr VSA system, holding the program key down for 4 seconds (without additionally pressing any other keys) will automatically start the suction system flushing function.***

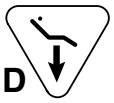
1.2 How to exit service mode and store settings

Briefly press the program key.

1.3 Navigating among the various service modes

The service modes are numbered with consecutive numbers. To move to the required service mode, use the chair up and down keys (“C” or “D”) on the control panel. All the patient chair control keys are now used for controlling the service mode and do not control the chair.

Press to move up in the list



Press to move down in the list

The current service mode number (symbol “n” followed by the current service mode number) is shown on the display when moving around in the list.

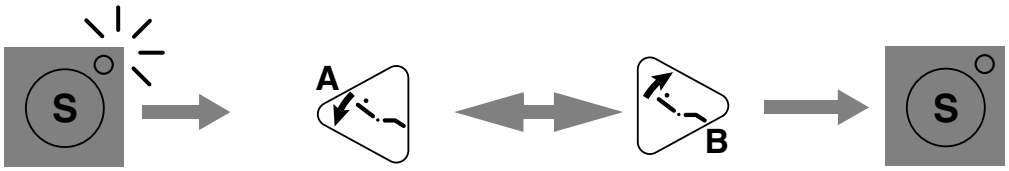
Due to the small display, there are not enough digits to show simultaneously the service mode number and its contents. Therefore the service mode number disappears after 1 second, after which the current service mode setting or value is displayed.

Checking the current service mode number

When the service mode setting is shown on the display, pressing briefly either of the moving keys (“C” or “D”) brings momentarily the number of the current service mode to the display. The unit does not move to the next (or previous) service mode.

1.4 Changing an adjustable setting in the service mode

Some of the service mode numbers display a decimal point after the symbol “n”. These modes have settings that can be changed. To change a setting do as follows:



Press and hold until LED lights to enter the SET mode

Decrease the setting

Increase the setting

Exit SET mode

a) Move to the desired service mode as described in 1.3 “Navigating among the various service modes”.

b) Enter the SET-mode by pressing and holding the “S”-key until the yellow indicator light turns on (1 or 5 seconds, depending on the service mode).

c) Decrease the setting with the “A”-key, or increase it with the “B”-key.

d) Exit the SET-mode by briefly pressing the S-key (the indicator light turns off). The SET-mode is exited automatically if you scroll to a different service mode using the “C” and “D” keys. However, any changes made to the previous service mode are stored.

NOTE ***To ensure that changes made in the service mode are stored, you must exit the service mode by using the program key. All altered settings, even if they have an immediate effect, are lost if the power is turned off before pressing the program key.***
This behaviour can, however, be used as a “master undo”, if you for some reason want to return to the previous settings. The factory presets (mode 16) are stored immediately and cannot be un-done.

1.5 Service mode functions short-form

The following pages list all available service modes as short-form tables. For detailed descriptions of the service modes, please refer to pages indicated in the right column.

The service modes are grouped according to functions into individual tables.

Table 1: MAIN control system related service modes

MODE	SERVICE MODE FUNCTION	Display / range	page
n.0	Disable programming and limit micromotor speed	0 - 15 (default = 0)	C-14
n 1	Show software version on MCB	n.nn.n	C-15
n 2	Show internal unregulated operating voltage	33.0VDC (±15%), 28.0...38.0 VDC	C-15
n 3	Show output current of IPS	0.00 - 7.00 A	C-15
n 4	Show output voltage of IPS	00.0 - 33.0 VDC	C-15
n 5	Show scaler electronics ID-code	0 = no scaler electronics installed 1 = Amdent 2 = EMS 3 = Satelec 4..7 = reserved	C-16
n 6	Show service door switch signal	0 = door closed 1 = door open	C-16
n 7	Show mains frequency	nn.n Hz (cycles/second)	C-16
n 8	Show (optional) assistant syringe hose ID	- = no hose connected 0 = not a syringe nn = syringe ID code	C-16
n 9	Show (optional) assistant syringe hose sense signal	0 - 255	C-16
n 10	Show MCB heatsink temperature	nn °C (or °F)	C-16
n.11	Enable (optional) water heater	1 = enabled (heating on) - = enabling (10 second delay) 0 = disabled (no heating, default)	C-17
n.12	Set main air valve operation	1 = always on A = automatic (default) 0 = always off	C-17
n.13	Set main water valve operation	1 = always on A = automatic (default) 0 = always off	C-17
n.14	Disable automatic functions in S-position	0 = no water to cup or cuspidor 1 = flush cuspidor only 2 = fill cup only 3 = fill cup, flush bowl (default)	C-17
n.15	Disable error messages	0 = no error messages are displayed 1 = error messages will show (default) 2 = error messages relating console arm are not displayed	C-17

Table 1: MAIN control system related service modes

MODE	SERVICE MODE FUNCTION	Display / range	page
n.16	Enable factory preset mode	A = perform service mode preset B = perform user mode preset	C-18
n.17	Select display units for pressures and temperature	1 = bar (n.nn) and Celsius (default) 2 = kPa (nnn) and Celsius 3 = PSI (nn.n) and Fahrenheit 4 = PSI (nn.n) and Celsius	C-18
n.18	Factory test	-	C-18

Table 2: Instrument MUX related service modes

MODE	SERVICE MODE FUNCTION	DISPLAY/RANGE	page
n 19	Show software version of IMUX CPU	n.nn	C-19
n 20	Show instrument holder & AUX-input signals	¦ ¦¦¦¦¦; ¦ =active (on), ı =in holder (off)	C-19
n 21	Show active instrument hose ID-code	---- = no active instrument selected nn = ID code 0 = no hose connected	C-19
n 22	Show active instrument hose identification signal	0 - 255	C-19
n 23	Show active instrument switch/sensor signal	0 - 255	C-19
n 24	Show console syringe location hose ID-code	0 = no hose, nn = ID code	C-19
n 25	Show console syringe location hose identification signal	0 - 255	C-20
n 26	Show console syringe switch signal	0 - 255	C-20
n 27	Show IMUX on/off valve signals	¦¦¦¦¦¦ (¦ = on, ı = off)	C-20
n 28	Show IMUX other output signals	¦¦¦¦¦¦ (¦ = on, ı = off)	C-20
n 29	Show air / water pressure difference	(±) n.nn bar; nnn kPa; nn.n PSI	C-20
n 30	Show active instrument drive/cooling air pressure	n.nn bar; nnn kPa; nn.n PSI	C-20
n.31	Select the service mode navigation type	0 = normal (default) 2 = accelerated	C-21
n 32	Show active instrument spray air pressure	n.nn bar; nnn kPa; nn.n PSI	C-21
n.33	Factory test		C-21
n 34	Show active instrument spray water pressure	n.nn bar; nnn kPa; nn.n PSI	C-21
n.35	Factory test		C-21
n.36	Set mode of IMUX membrane operation	1 = continuously on when unit is idle (default) 0 = off when unit is idle	C-21
n.37	Disable turbine contamination prevention system	1 = enabled (factory default) 0 = disabled	C-22
n 38	Show internal water or air pressure	A (A) = show internal air pressure H (B) = show internal water pressure X n.nn bar; X nnn kPa; X nn.n PSI	C-22

Table 3: Instrument related service modes

MODE	SERVICE MODE FUNCTION	DISPLAY/RANGE	page
n.39	Set maximum fibre optic and Intracam bulb voltage for selected hose type	---- = no valid hose selected 0 = factory default (nominal voltage) < 0 = decrease max. voltage > 0 = increase max. voltage	C-23
n.40	Fine-adjust bulb voltage for selected polymerization light	---- = no valid light selected 0 = factory default > 0 = increase voltage < 0 = decrease voltage	C-23
n.41	Set fibre optic light turn-off delay for all instruments	nn = seconds; factory default = 30 s.	C-23
n.42	Fine-adjust cooling air pressure for selected hose type	---- = no valid hose selected 0 = factory default < 0 = decrease cooling air pressure > 0 = increase cooling air pressure	C-23
n.43	Set mode of foot controlled chip-blow	1 = always dry (factory default) 0 = as auto-chip is programmed	C-23
n.44	Fine-adjust drive air pressure for selected hose type	---- = no valid hose selected 0 = factory default < 0 = decrease drive pressure > 0 = increase pressure	C-23

Table 4: Control panel related service modes

MODE	SERVICE MODE FUNCTION	DISPLAY/RANGE	page
n 45	Show control panel type/AUX input for branch 1	- = no panel found 0 = nurse's plus panel 1 = doctor's panel 2 = nurse's panel 3 = doctor's plus panel	C-24
n 46	Show control panel type/AUX input for branch 2	- = no panel found 0 = nurse's plus panel 1 = doctor's panel 2 = nurse's panel 3 = doctor's plus panel	C-24
n 47	Show control panel key code for branch 1	n.- = row, -.n = column	C-24
n 48	Show control panel key code for branch 2	n.- = row, -.n = column	C-24
n 49	Display test	All LEDs turn on	C-24

Table 5: Suction holder related service modes

MODE	SERVICE MODE FUNCTION	DISPLAY/RANGE	page
n 50	Show suction holder type and status for branch 1	n.¦¦¦¦; n=type, ¦ = active, ı = in holder	C-25
n 51	Show suction holder type and status for branch 2	n.¦¦¦¦; n=type, ¦ = active, ı = in holder	C-25
n 52	Show left (high volume) suction sensor signal for branch 1	0 - 255	C-25
n 53	Show middle (saliva) suction sensor signal for branch 1	0 - 255	C-25
n 54	Show right (ejector) suction sensor signal for branch 1	0 - 255	C-25
n 55	Show AUX input signal for branch 1	0 - 255	C-25
n 56	Show left (high volume) suction sensor signal for branch 2	0 - 255	C-26
n 57	Show middle (saliva) suction sensor signal for branch 2	0 - 255	C-26
n 58	Show right (ejector) suction sensor signal for branch 2	0 - 255	C-26
n 59	Show AUX input signal for branch 2	0 - 255	C-26

Table 6: Foot control related service modes

MODE	SERVICE MODE FUNCTION	DISPLAY/RANGE	page
n 60	Show software version in Foot Control CPU	n.nn	C-26
n 61	Show foot control switch signals	¦¦ ¦ ¦¦¦¦; JA, JB, AUX, A, B, C, D	C-26
n 62	Show pedal horizontal position coordinate	±255 (horizontal centre = 0)	C-27
n 63	Show pedal vertical position coordinate	±100 (vertical midway = 0)	C-27
n 64	Show left side sensor signal (unprocessed)	nnnn	C-27
n 65	Show right side sensor signal (unprocessed)	nnnn	C-27
n.66	Select foot control pedal operation mode	0 = normal (default) 1 = instrument control with vertical movement 2 = reversing of micromotor rotation is done with foot control 3 = reversing of micromotor rotation is done with foot control	C-27
n.67	Disable foot control pedal extra functions	1 = normal (all features, default) 0 = no extra functions	C-28
n.68	Disable automatic chair positions (A, B, C, D) from foot control	1 = normal (all features, default) 0 = only manual control of chair	C-28

Table 6: Foot control related service modes

MODE	SERVICE MODE FUNCTION	DISPLAY/RANGE	page
n.69	Momentary spray mode / spray with foot control mode	0 = momentary spray water off, instrument spray with foot control on (default) 1 = momentary spray water on, instrument spray with foot control on 2 = momentary spray water off, instrument spray with foot control disabled 3 = momentary spray water on, instrument spray with foot control disabled 4 = momentary spray disabled, instrument spray with foot control on 5 = factory use 6 = momentary spray disabled, instrument spray with foot control disabled 7 = factory use	C-28

Table 7: Operating light related service modes

MODE	SERVICE MODE FUNCTION	DISPLAY/RANGE	page
n 70	Show operating light button signal	0 = button released 1 = button pressed	C-29
n.71	Set OP-light maximum voltage	nn.n VAC (default 18.5)	C-29
n.72	Disable OP-light automatic turn off/on with chair	1 = synchronized with chair (default) 0 = completely independent	C-29
n.73	Disable OP-light automatic dimming with instrument console curing lights (not curing light in suction holder)	1 = automatic dimming (default) 0 = completely independent	C-29
n.74	Disable OP-light dimming function from its button	0 = dimmer function disabled from OP-light push-button 1 = dimmer function enabled (default) 2 = dimmer function disabled from control panel button 3 = dimmer function disabled	C-29

Table 8: Patient chair related service modes

MODE	SERVICE MODE FUNCTION	DISPLAY/RANGE	page
n 75	Show emergency stop switch signal	1 = emergency stop plate activated 0 = normal	C-30

Table 8: Patient chair related service modes

MODE	SERVICE MODE FUNCTION	DISPLAY/RANGE	page
n.76	Show lift mechanism position sensor signal	nnn	C-30
n.77	Show backrest mechanism position sensor signal	nnn	C-30
n.78	Select S position function mode	0 = previous position remains in memory when you drive from the spit position to an automatic position (S key indicator light ON) (default) 1 = previous position is cleared from the memory when you drive from the spit position to an automatic position (S key indicator light OFF)	C-30
n.79	Lift mechanism position sensor calibration mode	L-_ turn axle counterclockwise L-- ok L-¯ turn axle clockwise	C-30
n.80	Backrest mechanism position sensor calibration mode	b-_ turn axle counteclockwise b-- ok b-¯ turn axle clockwise	C-31

Table 9: Separator/suction system related service modes

MODE	SERVICE MODE FUNCTION	DISPLAY/RANGE	page
n 81	Show type of installed suction system	0 = Wet (or no) suction system 1 = Microvac II (Planmeca) 2 = Dürr Combisep 3 = Metasys 4 = Dürr VSA 5 - 7 = reserved	C-32
n.82	Set suction motor turn-off delay	mm.ss = minutes.seconds Cont = Continuously on (default 00.03 = 3 seconds)	C-32
n.83	Set number of suction hoses / disable suction system	0 = no suction system in unit 1 = one suction hose only 2 = two hoses (default) 3 = three hoses (maximum)	C-32

Table 9: Separator/suction system related service modes

MODE	SERVICE MODE FUNCTION	DISPLAY/RANGE	page
n.84	Set type of extra assistant instrument	0 = no extra assistant instrument 1 = assistant's syringe 2 = water operated saliva ejector 3 = assistant's syringe and water operated saliva ejector 4 = PM Starlight LED polymerization light 5 = assistant's syringe and PM Starlight 6 = water operated saliva ejector and PM Starlight 7 = assistant's syringe, water operated saliva ejector and PM Starlight	C-32

Table 10: MCB CPU direct I/O related service modes (for factory use)

MODE	SERVICE MODE FUNCTION	DISPLAY/RANGE	page
n 85	Show IC36 output signals	¦¦¦¦¦¦¦¦	C-33
n 86	Show IC37 output signals	¦¦¦¦¦¦¦¦	C-33
n 87	Show IC29 driver signals	¦¦¦¦¦¦¦¦	C-33
n 88	Show IC31 driver signals	¦¦¦¦¦¦¦¦	C-33
n 89	Show IC14 input signals	¦¦¦¦¦¦¦¦	C-34
n 90	Show IC16 input signals	¦¦¦¦¦¦¦¦	C-34
n 91	Show port A outputs (IC4)	¦¦¦¦¦	C-34
n 92	Show port A inputs (IC4)	¦¦¦	C-34

Table 11: Other service modes

MODE	SERVICE MODE FUNCTION	DISPLAY/RANGE	page
n.93	Adjustment of the duration of the spray water impulse	0 - 20, default = 1	C-35
n.94	Set syringe fibre optic light voltage	0 - 4 V, default = 3.7 V	C-35
n.95	Set spray water impulse pressure	0 - 30, default = 15	C-35
n.96	Enable low speed function for rotating instruments (Optional Plus package)	1 = enabled 0 = disabled (default)	C-35
n.97	Set suction system cleaning time	0 sec. - 20 min, default = 2 min	C-35

Table 11: Other service modes

MODE	SERVICE MODE FUNCTION	DISPLAY/RANGE	page
n.98	Select how to freeze Intracam image from foot control	0 = pedal movement has no effect 1 = pedal movement activates door open/nurse call relay (video printer freeze) 2 = pedal movement activates serial communication w. Dimaxis (default) (pedal to the left = toggle freeze/ unfreeze image, pedal to the right = save image) 3 = pedal movement activates relay and serial communication (1 + 2) 4 - 7 are the same as 0 - 3 but the pedal operation is vertical.	C-35
n.99	Instrument hose flushing operation: disable HE 99 message	0 = HE 99 is not displayed (default) 1 = HE 99 will show, but does not affect the unit functions 2 = HE 99 will show and the long flushing must be performed.	C-36
n.100	Select dental unit type	0 = Prostyle Compact unit without chair 1 = Prostyle Compact unit 2 = Prostyle Compact WE'S unit 3 = reserved for future use 4 = Planmeca Compact e 5 = Planmeca Compact i without chair 6 = Planmeca Compact i 7 = Planmeca Compact e with swivel position recognition ---- = unit type not selected	C-36
n.101	Interrupt waterline cleaning operation	0 = normal operation (default) 1-6 = waterline cleaning operation on	C-36
n.102	Disable dry spray mode when using Plus Package	0 = dry spray mode enabled 1 = dry spray mode disabled (Plus package signal tones) 2 = dry spray mode disabled (Normal signal tones) (default = 0)	C-37

Table 11: Other service modes

MODE	SERVICE MODE FUNCTION	DISPLAY/RANGE	page
n 103	Show the dental unit type	First digit shows type of Main PCB: 2 = Planmeca Compact i Second digit shows IMUX version: 0 = no IMUX 1 = IMUX PCB version E or older 2 = IMUX PCB version F-G (1.08.x) 3 = IMUX PCB version F-G (1.09.x or 1.10.x) 4 = IMUX PCB version H or never Third digit shows dental unit type: 0 = Prostyle Compact 1 = Planmeca Compact e 2 = Planmeca Compact i Fourth digit shows patient chair type: 0 = no patient chair 1 = Prostyle Compact chair without legrest or legrest up 2 = Prostyle chair with legrest down 3 = WE'S lifter 4 = Planmeca Compact e chair 5 = Planmeca Compact i chair with fixed legrest; or automatic legrest up 6 = Planmeca Compact i chair with 510 automatic legrest; in automatic state 7 = Planmeca Compact i chair with 460 automatic legrest; in automatic state 8 = Planmeca Compact e with swivel position recognition and fixed legrest 9 = Planmeca Compact e with swivel position recognition and automatic legrest A = Planmeca Compact e swivelled to 90° with automatic legrest	C-37
n. 104	Instrument multiplexer additional water valve control	0 = disabled (default) 1 = reserved for factory use 2 = enabled A = automatic	C-37
n.105	Enable/disable instrument places	¦¦¦¦¦ (= all instrument places enabled, default)	C-37
n.107	Triggering level of Er45 adjustment	1..17 (17 = default)	C-38
n.108	Stopping delay for instrument spray air	0..15 (4 = default)	C-38

Table 11: Other service modes

MODE	SERVICE MODE FUNCTION	DISPLAY/RANGE	page
n.109	Unit type setting to enable or disable the IMUX and the door features	0 = Compact i 1 = Compact e 28 = Cart 31 = Independent Cart 44 = no Instrument Console	C-38
n 110	Show IC39 outputs	For factory use	C-38
n 111	Show inputs IN3 (IC39)	For factory use	C-39
n 112	Show inputs IN4	For factory use	C-39
n 113	Show side delivery arm emergency switches signals	---- = no side delivery arm DxUy; x = downwards switch y = upwards switch 0 = switch not activated 1 = switch activated	C-39
n 114	Show bowl position	0 = bowl not in rest position 1 = bowl in rest position	C-39
n 115	Show glass identification signal	0 = glass is not in holder 1 = glass is in holder	C-39
n.116	Select glass filling mode	0 = no identification 1 = glass identification activated (default) 2 = automatic glass filling	C-39
n 117	Show active time of drive air pulse width modulation	For factory use	C-39
n 118	Show active time of spray water pulse width modulation	For factory use	C-39
n 119	Show active time of spray air pulse width modulation	For factory use	C-39
n 120	Show active instrument power consumption	nn W	C-40
n.121	Select the length of the automatic legrest	0 = 510 (default) 1 = 460 2 = 390	C-40
n.122	Factory test	-	C-40
n.123	Factory test	-	C-40
n.124	Set the type of Planmeca Compact i	0, 1	C-40
n 125	Show Water management system status	nnn	C-40
n 126	Show Water management system inputs and outputs	¦¦¦¦¦¦¦¦	C-41
n.127	Water management system water flow adjustment		C-41
n.129	Adjustment of the upper limit of pre-programmed chair positions		C-41
n.130	Disable WCS	0 = WCS in use (default) 1 = Starting of WCS disabled 2 = WCS totally disabled	C-41
n.131	WCS: adjustment of the syring cleaning solution filling time	20 - 180, (default = 40)	C-41

2 SERVICE MODE DETAILED DESCRIPTION

The following pages contain detailed information about the service modes, giving useful information on how to use and interpret the information available. Reading this chapter gives a good understanding of the unit's control system. Used abbreviations are explained in the beginning of this manual.

Underlined number or values in the heading texts are factory default values.

2.1 MAIN control system related service modes

n.0 Disable programming and limit micromotor speed

(For educational establishment use.) In this mode the programming of the instrument, unit and/or chair settings can be disabled, and the micromotor power can be limited to 50% of the maximum speed.
The following settings are possible. The factory default is 0 (zero).

	instrument settings disabled	unit settings disabled	chair settings disabled	micromotor speed limited
0				
1	x			
2		x		
3	x	x		
4			x	
5	x		x	
6		x	x	
7	x	x	x	
8				x
9	x			x
10		x		x
11	x	x		x
12			x	x
13	x		x	x
14		x	x	x
15	x	x	x	x

n 1 Show software version on MCB (n.nn.n version)

Shows the currently installed software version on the MCB. The software version is also briefly displayed whenever the unit is turned on. There is normally also a label on top of the software chip containing the same information.

The unit's behaviour, features and functions depend completely on the installed software. Always use the latest software available, especially if you notice that some features are missing described in any available documentation.

Some new instruments or retrofittable extensions might require a MCU software upgrades. In this case the unit will display automatically respective help or error codes (HE9, HE14, E16, E19.n, E32.n, E47.n, E52, E62).

The foot-control and the IMUX also both contain microprocessors. Their software is "embedded" inside their respective CPU's and cannot therefore be replaced. Since the "main brain" is the MCB and its microprocessor, there is rarely ever a need for this. However, you can check their software versions by using service modes n19 and n60 (respectively).

n 2 Show internal unregulated operating voltage (nn.n volt)

This voltage reflects mains voltage magnitude variations. The nominal value is +33VDC and is allowed to vary ± 15% (28...38V) without affecting the normal operation of the unit.

If one of the MCB electronics fuses (F9 or F10) is blown, the display will only be half of normal (Ý16.5VDC ± 15%). If the internal voltage is too low or too high, the unit will show respective error codes (E9 or E10). If the internal voltage rises above 44VDC (a heavy mains surge, too high mains voltage, wrong voltage jumper position or wrong transformer primary wiring), an internal protection circuitry will blow fuses F9 and F10, protecting the unit electronics from failure.

n 3 Show output current of IPS (n.nn ampere)

This is the output current of the instrument power supply (IPS) located on the MCB. This microprocessor controlled power supply feeds power to micromotors, light-curing bulbs and scaler units. This built-in ampere meter is intended for checking the current consumption of the selected instrument. If the current is continuously zero it indicates an open-circuit somewhere between the MCB and the instrument. This mode is also good for checking the no-load current of micromotors, that is a direct indication of the motor condition.

n 4 Show output voltage of IPS (n.n volt)

This is the output voltage of the instrument power supply (IPS) located on the MCB. This microprocessor controlled power supply feeds all micromotors, light-curing bulbs and scaler units with appropriate voltages. The voltage on the display is measured directly at the IPS output on the MCB, therefore the voltage shown is normally somewhat higher than the instrument receives. However, the voltage drop in the cabling is compensated for so that instruments always receive a proper voltage.

n 5 Show scaler electronics ID-code (n id-code) and connection point of the scaler electronics (--n-) or (---n)

The (optionally) installed scaler electronics module is identified by a jumper wire on its connector that plugs to the MCB. It is important for the MCB to know the type of scaler electronics installed. This service mode allows you to check what type of scaler electronics is installed and that the identification works properly. It is also possible to check if the scaler electronics is installed on the MCB or at the IMUX.

The location of the scaler electronics is indicated on the display by pressing the S-key with delay. If the display (--n-) is shown then the electronics is connected to IMUX or (---n) then the electronics is connected to MCB.

0 No scaler electronics module installed
1 AMDENT scaler module installed
2 EMS scaler module installed
3 SATELEC scaler module installed
4..7 reserved

n 6 Show service door switch signal (n door status)

This is the signal from the microswitch that indicates the door status (1 = door open, 0 = door closed). An open circuit, broken wire or loose connector is interpreted as the door would be continuously open. During this condition the chair cannot be run, except for in the service mode when the control system temporarily ignores this signal.

n 7 Show mains frequency (nn.n Hz)

There is no other use for this service mode than checking the condition of a part of the MCB electronics. If everything is OK the display should be stable within ±2 digits. Severe mains voltage transients can up-set the display temporarily, and would also cause the OP-light to flicker. If this display is stable but the OP-light flickers occasionally, it's probably caused by a bad bulb socket.

n 8 Show (optional) assistant syringe hose ID (n id-code)

If no hose is connected (or if the assistant syringe option is not installed) the display should show a dash "-". If any other instrument than a syringe is connected then the display should show 0 (zero). If a valid syringe (hose) is connected then the display shows the syringe hose ID-code (e.g. 20).

n 9 Show (optional) assistant syringe hose sense signal (nnn signal)

Same as above but this is the direct signal from the assistant syringe hose identification circuitry. The display range is 0-255. 255 indicated an open circuit, 0 indicated a short, any other values represent the signal. The display should be fully stable within one digit.

n 10 Show MCB heatsink temperature (nn °Celsius or °Fahrenheit)

The temperature is measured inside the black aluminum block on the MCB. During normal circumstances the temperature should stay below 55°C. The temperature can rise above this level if the fixing screws (that attach the heatsink to the aluminum box) are missing. To protect against overheating the CPU turns off those loads that contribute to the power dissipation (OP-light and IPS) if the temperature rises above 60°C, The error E15 is then also displayed.

n.11 Enable (optional) water heater (n mode = 0, 1)

The purpose of this mode is to guarantee that the (optional) water heater is not powered up without water. When the unit is shipped from the factory the mode is set to 0 (heater off). During the installation (but after the water and drain is connected) this mode should be set to 1 (if there is a water heater attached). When the mode is set to 1, water will be flown from the glass fill for 10 seconds.

n.12 Set main air valve operation (n mode = 0, A, 1)

The main (incoming) air valve is controlled by the CPU. The operation is automatic, in other words, the valve opens only when necessary. This behaviour can be temporarily bypassed in this service mode. Set the mode to 0 (zero) to keep the valve continuously closed, set to “A” to go back to automatic or set to 1 to force the valve to open. Please note that even if this mode is programmed to 0 or 1, it always automatically defaults to “A” after turning off the power to the unit.

n.13 Set main water valve operation (n mode = 0, A, 1)

The main (incoming) water valve is controlled by the CPU. The operation is automatic, in other words, the valve opens only when necessary. This behaviour can be temporarily bypassed in this service mode. Set the mode to 0 (zero) to keep the valve continuously closed, set to “A” to go back to automatic or set to 1 to force the valve to open. Please note that even if this mode is programmed to 0 or 1, it always automatically defaults to “A” after turning off the power to the unit.

n.14 Disable automatic functions in S-position (n mode = 0, 1, 2, 3)

This service mode can be used to disable automatic cuspidor flush and cup fill functions when using the chair S-position. 0 = no automatic functions, 1 = cuspidor flush only, 2 = cup fill only, 3 = both.The factory default is 3 (all functions).

n.15 Disable error messages (n mode = 0, 1, 2)

This service mode can be used to disable the error message display system. The only use for this mode is during exhibitions or in showrooms where a full installation is not possible (no water and/or water pressure), and because of this error messages would be continuously displayed. Set the mode to 0 to disable the error messages, or to 1 to enable the error messages (factory default), or to 2 to disable the error messages related to the console arm. The unit shows shortly HE12 when turning the power on (remainder of that the error messages are disabled).

n.16 Enable factory preset mode (- or S U)

This service mode is used to set the unit to a predefined state only using few keystrokes. This feature is mainly used at the factory, that is why it is called a “factory preset”. All user programmable settings and parameters, as well as the most important service mode settings can be set to a “normal” state. Then the unit can be immediately operated without having first to do any adjustments or programming. This is useful also on the field if a showroom unit is installed later for clinical use.

Upon entry this service mode shows a dash (-) in the display. Press the S-key for 2 seconds (prevents accidental entry) so that the yellow LED lights in the key. The display now shows S U.

Performing user mode presets

Press the B-key briefly (“below” the U symbol in the display) to perform the user mode presets (the display shows FP.U during the process). Pressing the B-key sets the factory presets for the user-controlled settings, which are: period of glass filling, period of bowl rinsing, period of door open/nurse call, settings of the dentists (chair positions: backrest, height, light), timer settings, intensity of the operating light and instrument settings (spray, power reduction, chip blow etc.). After performing the user mode presets the text “turn off” will flash on the display. Now turn off the unit.

Performing service mode presets

Press the A-key briefly (“below” the S symbol in the display) to perform the service mode presets (the display shows FP.S during the process). Pressing the A-key sets the factory presets for all the service mode settings. After performing the service mode presets the text “turn off” will flash on the display. Now turn off the unit.

n.17 Select display units for pressures and temperature (n mode = 1, 2, 3, 4)

The unit can show pressures (in the service mode) in either bar, kPa or PSI. Select mode 1 to show the pressure in bar (factory default), 2 to show the pressures in kPa (kiloPascal), or 3 to show the pressures in PSI (pounds per square inch). If mode 3 is selected additionally temperature displays (ex. service mode 10) are shown in °Fahrenheit instead of °Celsius. Select mode 4 to show the pressure in PSI and temperature in °Celsius.

n.18 Factory test

Reserved for factory use.

2.2 Instrument MUX related service modes

n 19 Show software version of IMUX CPU (n.nn software version)

This is the software version of the embedded software inside the IMUX CPU EEPROM. This software can be updated on the field.

n 20 Show instrument holder & AUX-input signals (¦ ¦¦¦¦¦ signal)

This service mode is convenient for checking the proper operation of the doriot arm sensors (on the IMUX PCB). The 5 rightmost segments represent the 5 instrument positions, from right to left respectively. A short vertical bar indicated that the instrument is in the holder, a long vertical bar that it is taken out from the holder. The leftmost vertical bar shows the signal at the AUX input terminal on the IMUX PCB (6th instrument place).

n 21 Show active instrument hose ID-code (---- or nn ID-code)

This mode is convenient for checking the instrument hose ID-code and the related electronics on the IMUX PCB. The code range is 1 to 26.

The display shows four dashes (----) if no instrument is selected. Activate a properly attached instrument hose (in this same location) to display the ID-code. The code displayed should be the same as indicated by the last digit(s) on the label on the quick connector.

n 22 Show active instrument hose identification signal (nnn signal)

This service mode is similar to the one above. This mode shows the actual signal measured from the identification pins on the instrument hose quick connector. The signal range is 0 to 510.

The display should show 223 to 228 when no instrument is selected (the electronics measures a local reference signal). If the signal is outside this range then there is an error on the IMUX PCB. Check for any water leakage.

Activate a properly attached instrument hose (in this same location) to display the identification signal.

n 23 Show active instrument switch/sensor signal (---- or nnn signal)

This service mode shows the instrument (optional) switch or sensor input signal. The display shows four dashes (----) if no instrument is selected. The display range is 0 to 255.

Activate a properly attached instrument hose (in this same location) to display the ID-code.

n 24 Show console syringe location hose ID-code (nn ID-code)

This service mode shows the hose ID-code for the hose connected to the syringe location. The displays zero (0) if no hose is attached, otherwise the hose ID-code is displayed continuously.

n 25 Show console syringe location hose identification signal (nnn signal)

This service mode shows is similar to the one above. This mode shows the actual signal measured from the identification pins on the connected hose. The display range is 0 to 255. A continuous 255 indicates an open circuit, a continuous 0 a short. The signal should be stable within ± 1 digit.

n 26 Show console syringe switch signal (nnn signal)

This service mode shows the (optional) switch signal from the syringe. At this moment no syringes use this signal, therefore 255 is always shown.

n 27 Show IMUX on/off valve signals (¦ ¦ ¦ ¦ ¦ signal)

This service mode shows the actual driver output signals controlling the on/off type electromagnetic valves inside the IMUX. The five first vertical segments (counting from right) represent the four instrument and one syringe select valves, respectively.

The sixth (leftmost) vertical bar shows the (optional) steripump control valve / extra water valve signal.

A short vertical bar indicates that the valve is off and that the valve is connected properly (not open circuited). A long vertical bar indicates that either the valve is on or that the valve is open circuited.

When the SET-mode is entered, IMUX IC16 output signal feedback inputs are displayed:

1st vertical segment (counting from right): Syringe water control
2nd: Instrument 4 membrane control valve
3rd: Instrument 3 membrane control valve
4th: Instrument 2 membrane control valve
5th: Instrument 1 membrane control valve
6th: steripump control valve / extra water valve
7th: Syringe fibre light electronics
8th: Syringe heater

n 28 Show IMUX other output signals (¦ ¦ ¦ ¦ ¦ signal)

This service mode is similar to the one above. This mode shows the other outputs driver statuses controlling the relays and other outputs. This service mode is mainly intended for factory use.

n 29 Show air / water pressure difference

This service mode shows the measured pressure difference between the internal continuous air pressure and the regulated spray water fed to the instruments. This pressure difference should always be greater than 1 bar (100kPa) to guarantee proper operation.

n 30 Show active instrument drive/cooling air pressure (n.nn bar; nnn kPa; nn.n PSI pressure)

This service mode shows the signal from the drive/cooling air line pressure sensor. The display is either in bar, kPa or PSI, depending of the setting in the service mode n.17. The pressure is measured inside the IMUX just after the proportional valve controlling this line. Therefore this pressure display is (under normal flow conditions) always higher than the pressure measured at the instrument end of the hose.

n 31 Select the service mode navigation type (0, 1, 2, 3)

In this service mode the service mode navigation type can be selected.

0 = Normal navigation. The service mode number is changed in steps of one when using the chair up and down keys (“C” or “D”) on the control panel.
1 = factory use
2 = Accelerated navigation. The service mode number is changed in steps of 5 when the chair up or down is pressed and held down.
3 = factory use

The factory default is 0.

n 32 Show active instrument spray air pressure (n.nn bar; nnn kPa; nn.n PSI pressure)

This service mode shows the signal from the spray/chip air line pressure sensor. The display is either in bar, kPa or PSI, depending of the setting in the service mode n.17. The pressure is measured inside the IMUX just after the proportional valve controlling this line. Therefore the pressure measured (under normal flow conditions) is always higher than this same pressure measured at the instrument end of the hose.

n.33 Factory test

Reserved for factory use.

n 34 Show active instrument spray water pressure (n.nn bar; nnn kPa; nn.n PSI pressure)

This service mode shows the signal from the spray water line pressure sensor. The display is either in bar, kPa or PSI, depending of the setting in the service mode n.17. The pressure is measured inside the IMUX just after the proportional valve controlling this line. Therefore the pressure measured (under normal flow conditions) is always higher than this same pressure measured at the instrument end of the hose. Because of the construction of the water channel the pressure drops very slowly towards 0 (zero).

n 35 Factory test

Reserved for factory use.

n.36 Set mode of IMUX membrane operation (n mode = 0, 1)

This service mode selects the mode of operation of the IMUX instrument select membrane control valves. The unit software must be upgraded if mode 1 is not available and needs to be used. This feature was added to the software version 1.23 (and later).

Mode 1 is recommended to be selected in new units, since in this mode all instrument select membranes in the IMUX will stay normally closed (pressurized). The benefit is that there is no risk of water leakage or occasional water drops from the instruments. In this mode the integral spray water back pressure valves are only needed when the unit is powered off. This continuous activation of the (4) valves causes some additional heat dissipation in the IMUX (about 8W). Early IMUX assemblies have not been tested with this higher power dissipation and could give problems (due to some tight tolerances) with sticking doriot arm pins. Assuming that the pins are replaced with thinner ones, then the mode 1 can be used in all IMUXes.

Mode 0 is recommended to be selected in older units with IMUX assemblies manufactured earlier than Jan. -96. In this mode all instrument select membranes stays whenever possible open (not pressurized). Then prevention of water dropping from instruments (when idle) is fully dependent of the operation of the integral back pressure valves.

n.37 Disable turbine contamination prevention system (n mode = 0, 1)

This service mode can be used to disable the software controlled turbine contamination prevention system. It is recommended to keep this mode turned on (1) at all s to guarantee maximum turbine hygiene.

Set this mode temporarily to 0 (zero) if you want to compare or demonstrate the difference in turbine performance. This demonstration should be done with the turbine connected to an instrument location not having a built in CP (contamination prevention) valve (no label close to the IMUX quick connector).

The turbine contamination prevention system is based on a sophisticated software algorithm that controls the turbine in such a way that the turbine head can never produce vacuum, therefore minimizing the risk of contaminating the turbine or the turbine quick-connector.

n 38 Show internal water or air pressure (A H)

This service mode can be used to check the internal water and air pressures.

Checking the air pressure (An.nn bar; Annn kPa; Ann.n PSI)

Press the A-key to enter the air pressure measurement mode. The display shows the air pressure either in bar, kPa or PSI (depending of the setting in service mode 17). The display stabilizes within a few seconds. The static air pressure should be 5.5 bar (550 kPa).

Checking the water pressure (Hn.nn bar; Hnnn kPa; Hnn.n PSI)

Press the B-key to enter the water pressure measurement mode. The display shows the water pressure either in bar, kPa or PSI (depending of the setting in service mode 17). The display stabilizes within a few seconds. The static water pressure should be 2.5 to 2.8 bar (250 to 280 kPa).

NOTE ***Please make sure that there is at least one water consuming instrument hose connected before performing the water pressure measurement (a scaler, turbine or micromotor hose). Leaving the water pressure measurement mode causes the unit to turn off valves in the console, resulting in a small amount of water (a few drops) flowing out from the IMUX. This behaviour is fully normal and is due to the way the measurement is performed (using the spray water line sensor).***

2.3 Instrument related service modes

n.39 Set maximum fibre optic and Intracam bulb voltage for selected hose type (---- or n range = <0... 0 ...0>)

This service mode can be used to fine adjust the maximum allowed fibre-optic light bulb voltage for the selected hose type. The display shows four dashes (----) if no valid hose is selected. When a hose (instrument) that contains a fibre-optic light is selected the displays shows the setting for this hose type. The factory default is 0 (zero). Positive values increase, negative decrease the factory default. Each step equals about 50mV. Determine the bulb voltage by measuring it directly at the bulb socket when the bulb is on. Never exceed the maximum allowed voltage.

n.40 Fine-adjust bulb voltage for selected polymerization light (---- or n range = <0... 0 ...0>)

This service mode can be used to fine adjust the polymerization light bulb voltage. The display shows four dashes (----) if no valid polymerization light is selected. The factory default is 0 (zero). Positive values increase, negative decrease the factory default. Each step equals about 50mV. Determine the bulb voltage by measuring it directly at the bulb socket when the bulb is on. Never adjust the voltage higher or lower than rated.

n.41 Set fibre optic light turn-off delay for all instruments (nn seconds)

This service mode can be used to alter the turn-off delay for instruments with an internal fibre-light. The factory default is 30 seconds.

n.42 Fine-adjust cooling air pressure for selected hose type (---- or n range = <0... 0 ...0>)

This service mode can be used to fine adjust the cooling air pressure (flow rate) to the selected hose (instrument) type. The display shows four dashes (----) if no valid hose is selected. Valid hoses are all micromotors, polymerization lights without a built-in fan (Lysta, Satelec) and IntraCam. The factory default is 0 (zero). Positive values increase, negative decrease the factory default. Using too little air could overheat the instrument. Using too much air can cause other problems (light guides or handpieces popping off).

n.43 Set mode of foot controlled chip-blow (n range = 0,1)

This service mode can be used to alter the behaviour of the manual (foot controlled) chip blow. The factory default is 1 (one) that results always in a air-only (dry) manual chip blow, independent of the instrument automatic chip blow water/air flow selection. The setting 0 (zero) causes the manual chip blow to behave the same way as the automatic one.

n.44 Fine-adjust drive air pressure for selected hose type (---- or n range = <0... 0 ...0>)

This service mode can be used to fine adjust the air driven instrument's maximum drive air pressure for the selected hose (instrument) type. The display shows four dashes (----) if no valid hose is selected. Valid hoses are all turbine- and air-motor hoses. The factory default is 0 (zero). Positive values increase, negative decrease the factory default.

2.4 Control panel related service modes

n 45 Show control panel type/AUX input for branch 1 (n = -, 0, 1, 2, 3)

This service mode shows the type of the control panel connected to the MCB branch 1 (normally the dentist's console control panel). A dash (-) indicates either that no control panel is connected to this branch, the cable to the panel is loose or faulty, or that the panel itself does not respond. The numbers 0-3 show that the panel is communicating with the MCB. 0 = nurse’s panel, 1 = doctor’s panel, 2 = nurse’s plus panel, 3 = doctor’s plus panel.

n 46 Show control panel type/AUX input for branch 2 (n = -, 0, 1, 2, 3)

This service mode shows the type of the control panel connected to the MCB branch 2. See explanation above.

n 47 Show control panel key code for branch 1 (n.n)

This service mode shows which key is pressed on the control panel connected to MCB branch 1 (normally the dentist's console control panel). The left side digit (of the decimal point) indicates the row, the right side digit indicates the column.

n 48 Show control panel key code for branch 2 (n.n)

This service mode shows which key is pressed on the control panel connected to MCB branch 2. See explanation above.

n 49 Display test

This service mode turns on all individual LEDs and display segments on the control panel(s). Can be used to check that all displays work properly.

2.5 Suction holder related service modes

n 50 Show suction holder type and status for branch 1 (n. ¦ ¦¦¦¦)

This service mode shows the suction hose holder sensor statuses and sensor PCB type connected to the MCB branch 1 (normally the dentist's console suction hose holder). The three (3) rightmost vertical bars represents the sensor statuses (hose in/out) from the three hose sensors.

The fourth (leftmost) vertical bar shows the signal from the optional AUX input on the sensor PCB (reserved for future use). A number 0 (zero) to the left indicates either that no suction hose holder is connected to this branch, the cable to the hose sensor PCB is loose or faulty, or that the sensor PCB itself does not respond. A number other than 0 (zero) shows that sensor PCB is communication with the MCB. Currently only type 1 is in use.

n 51 Show suction holder type and status for branch 2 (n. ¦ ¦¦¦)

This service mode shows the suction hose holder sensor statuses and sensor PCB type connected to the MCB branch 2 (normally the assistant side suction hose holder). See explanation above.

n 52 Show left (high volume) suction sensor signal for branch 1 (nnn signal)

This is the direct sensor signal from the high volume hose sensor (leftmost) on the suction hose sensor PCB connected to MCB branch 1 (normally the dentist's console suction hose holder).

The display range is 0 to 255. When a hose is in the holder the display should be in the range 120...255, when no hose is in the holder the signal should be in the range 80... 200.

n 53 Show middle (saliva) suction sensor signal for branch 1 (nnn signal)

This is the direct sensor signal from the saliva suction hose sensor (middle) on the suction hose sensor PCB connected to MCB branch 1 (normally the dentist's console suction hose holder). See service mode n52 for further information.

n 54 Show right (ejector) suction sensor signal for branch 1 (nnn signal)

This is the direct sensor signal from the ejector/assistant syringe sensor (right) on the suction hose sensor PCB connected to MCB branch 1 (normally the dentist's console suction hose holder). See service mode n52 for further information.

n 55 Show AUX input signal for branch 1 (nnn signal)

This is AUX input signal on the suction hose sensor PCB connected to MCB branch 1 (normally the dentist's console suction hose holder). This signal is reserved for future use and shows always 255.

n 56 Show left (high volume) suction sensor signal for branch 2 (nnn signal)

This is the direct sensor signal from the high volume hose sensor (leftmost) on the suction hose sensor PCB connected to MCB branch 2 (normally the assistant side suction hose holder).

The display range is 0 to 255. When a hose is in the holder the display should be in the range 120...255, when no hose is in the holder the signal should be in the range 80... 200.

n 57 Show middle (saliva) suction sensor signal for branch 2 (nnn signal)

This is the direct sensor signal from the saliva suction hose sensor (middle) on the suction hose sensor PCB connected to MCB branch 2 (normally the assistant side suction hose holder). See service mode n56 for further information.

n 58 Show right (ejector) suction sensor signal for branch 2 (nnn signal)

This is the direct sensor signal from the ejector/assistant syringe sensor (right) on the suction hose sensor PCB connected to MCB branch 2 (normally the assistant side suction hose holder). See service mode n56 for further information.

n 59 Show AUX input signal for branch 2 (nnn signal)

This is AUX input signal on the suction hose sensor PCB connected to MCB branch 2 (normally the assistant side suction hose holder). This signal is reserved for future use and shows always 255.

When the S-key is pressed, special foot control calibration check mode is entered. This mode is for factory use only. Exit the mode by pressing the S-key again.

2.6 Foot control related service modes

n 60 Show software version in Foot Control CPU (n.nn version)

This is the version of the software embedded in the foot control CPU EPROM. This software cannot be updated on the field.

n 61 Show foot control switch signals (¦¦ ¦ ¦¦¦¦)

This service mode displays all digital input signals in the foot control. The meaning of the vertical bars (from left to right) is; jumper A, jumper B, AUX input, Chair A, Chair B, Chair C, Chair D.

A short vertical bar indicates an off state (no signal / no jumper), a long vertical bar indicates an on state (signal / jumper). Jumpers A and B are optional (not needed) in the Prostyle Compact unit. The AUX in-put is reserved for future use. Chair A,B,C,D signals are convenient for checking the proper operation of the chair control knob, its magnet and HALL-sensors.

n 62 Show pedal horizontal position coordinate (n range -255 to 255)

This service mode displays the horizontal position of the foot control pedal. The display range is from -255 to 255. The display must be 0 (zero) when the pedal is in the middle (rest position). Moving the pedal sideways ±6mm should still produce 0 (zero) on the display. Bringing the pedal to about 5mm from the left side extreme (mechanical stop) should show -255 on the display. Likewise bringing the pedal 5 mm from the right extreme should show 255 on the display. Pushing the pedal down during this test should not change the display more than ± 15%. Perform the foot control calibration as described in 2.6 “Calibrating foot control” on page H-15 if the above described cannot be achieved.

n 63 Show pedal vertical position coordinate (n range -100 to 100)

This service mode displays the vertical position of the foot control pedal. The display range is -100 to 100. Pushing the pedal down changes the display sign (positive/negative). Both extremes (pedal idle / pedal pushed down) should be symmetrical within 20%. Typical idle value is 50 to 80. Perform the foot control calibration as described in 2.6 “Calibrating foot control” on page H-15 if the above described cannot be achieved.

n 64 Show left side sensor signal (unprocessed) (nnnn signal)

This service mode shows the direct signal of pedal position (left side sensor). When the pedal is in the middle (rest) position the number should be in the range 3000 to 7000. The sensor plate under the foot control PCB is too far from the PCB if the number is smaller than 3000. During this condition it could be impossible to properly calibrate the foot control. The proper distance between the plate and the bottom surface of the PCB is 0.5 mm (± 0.1 mm). Under no circumstances should the plate be allowed to come in contact with the PCB.

n 65 Show right side sensor signal (unprocessed) (nnnn signal)

This service mode shows the direct signal of pedal position (right side sensor). See explanation above for details.

n.66 Select foot control pedal operation mode (n mode = 0, 1, 2, 3)

This service mode can be used to select the foot control pedal instrument control mode.

Mode 0 is normal pedal operation (default). The instruments are controlled with horizontal movement of the pedal.

In mode 1 the instruments are controlled with vertical movement of the pedal. Instrument spray is switched on and off by moving the pedal to the left. The manual chip blow is activated by moving the pedal to the right. Other functions work normally. Note that this feature is recommended to be used only with a new type foot control pedal (from foot control serial number 813542).

In mode 2 the instruments are controlled with horizontal movement of the pedal, and the reversing of the micromotor rotation is done with foot control as follows. To operate the micromotor normally (in a clockwise direction) push the pedal to the left. To reverse the direction of rotation push the pedal to the right. Note, that the reverse rotation of micromotor key does not function in this mode.

In mode 3 the instruments are controlled with horizontal movement of the pedal, and the reversing of the micromotor rotation is done with foot control as follows. To operate the micromotor normally (in a clockwise direction) push the pedal to the right. To reverse the direction of rotation push the pedal to the left. Note, that the reverse rotation of micromotor key does not function in this mode.

n.67 Disable foot control pedal extra functions (n mode = 0, 1)

This service mode can be used to disable the foot control pedal extra functions. Number 0 (zero) removes ALL extra features. Then the foot control pedal can be used only to control the instruments. Number 1 (one, factory default) enables all possible pedal functions. This currently includes; EXT- function control (nurse call/door open/table instrument control), cup filling + cuspidor rinsing, and patient chair S position control. Other mode numbers are reserved for future use.

n.68 Disable automatic chair positions (A, B, C, D) from foot control (n mode = 0, 1)

This service mode can be used to disable the foot controlled pre-programmed chair positions. Number 0 (zero) disables these automatic functions from the chair control knob. Then this knob only operates the chair manually (backrest up/down, seat up/down). Number 1 (one, factory default) enables the automatic chair position control (short activation of the knob runs chair to a pre-programmed position).

n.69 Momentary spray mode / spray with foot control mode (n mode = 0, 1, 2, 3, 4, 5, 6, 7)

This service mode can be used to select the momentary spray and spray with foot control modes. The momentary spray can either be **totally** disabled or momentary spray water can be switched off. The instrument spray operated with foot control **can also be disabled in this service mode, when the spray can only be operated from the control panel**.

NOTE ***The momentary spray is activated when the pedal is pressed down while instrument in use.***

0 = momentary spray **water off**, instrument spray with foot control **on** (default)
1 = momentary spray **water on**, instrument spray with foot control **on**
2 = momentary spray **water off**, instrument spray with foot control **disabled**
3 = momentary spray **water on**, instrument spray with foot control **disabled**
4 = momentary spray **disabled**, instrument spray with foot control **on**
5 = factory use
6 = momentary spray **disabled**, instrument spray with foot control **disabled**
7 = factory use

2.7 Operating light related service modes

n 70 Show operating light button signal (n signal)

This service mode can be used to check the operation of the operating light (Delight) push-button. The display should show 0 (zero) when the button is released (open circuit) and 1 (one) when the button is pressed (short circuit).

n.71 Set OP-light maximum voltage (nn.n voltage)

This service mode adjusts the maximum allowed voltage (Vrms) to the operating light bulb. The factory default is 18.5 (volts) that is valid for a Planmeca manufactured Delight operating light, when directly installed in the unit. Using this service mode it is easy to adapt the unit to any type of light as long as the maximum load ratings (24V, 150W bulb) are not exceeded. The voltage drop in long rungs of wire (if the light is fed by the unit electronics but assembled in the ceiling) can be compensated for within certain limits. Use a true RMS voltage meter and check the actual voltage directly at the bulb socket if the installation differs from the standard (direct unit installation of Delight).

n.72 Disable OP-light automatic turn off/on with chair (n mode = 0, 1)

This service mode can be used to disable the automatic turn off /on of the operating light when recalling pre-programmed chair positions. To achieve this set the mode to 0 (zero). Mode 1 (one) enables this function (factory default).

n.73 Disable OP-light automatic dimming with instrument console curing lights (not curing light in suction holder) (n mode = 0, 1)

This service mode can be used to disable the automatic dimming of the operating light when handling the (optional) polymerization light handpieces. Set the mode to 0 (zero) for fully independent operation. Mode 1 (one, factory default) enables the dimming feature.

n.74 Disable OP-light dimming function from its button (n mode = 0, 1, 2, 3)

This service mode can be used to disable the automatic dimming of the operating light. Set the mode to 0 (zero) for disabling the dimming function from the OP-light push-button. Mode 1 (one, factory default) enables the dimming feature when pressing and holding down either the operating light push-button or the control panel button. Set the mode to 2 (two) for disabling the dimming function from the control panel button. Mode 3 (three) disables the OP-light dimming function.

2.8 Patient chair related service modes

n 75 Show emergency stop switch signal (n signal)

This service mode is used to check the proper operation of the emergency stop switch under the chair bottom. The display should normally show 0 (zero) if nothing is touching the plate (switch closed) and the cable and connectors are OK. Pushing the plate upwards must change the display to 1 (one) (switch opens). A continuous open circuit in the cables (or a short from either of the emergency stop switch signal cables to the chassis) would also cause the display to show 1 (one).

n.76 Show lift mechanism position sensor signal (nnn signal)

This service mode shows the signal from the multi-turn potentiometer that is used as a position sensor for the lift mechanism. This potentiometer is mounted directly to the motor, very close to where the worm-screw axle exits the gearbox. The display range is 0 to 255. Driving the mechanism up increments the number, driving the mechanism down decrements the number. The displayed number should be stable within ± 1 digit when not driving the chair. The control system refuses to drive the motor (in the respective direction) if the signal is under 25 or above 240.

n.77 Show backrest mechanism position sensor signal (nnn signal)

This service mode shows the signal from the multi-turn potentiometer that is used as a position sensor for the backrest mechanism. This potentiometer is mounted directly to the motor, very close to where the worm-screw axle exits the gearbox. The display range is 0 to 255. Driving the backrest up increments the number, driving the backrest down decrements the number. The displayed number should be stable within ± 1 digit when not driving the chair. The control system refuses to drive the motor (in the respective direction) if the signal is under 1 or above 240.

n.78 Select S position function mode (n mode = 0, 1)

This service mode is used to select the S position function mode.

0 = Previous working position is stored in memory when the chair is driven from the spit position to an automatic position (A, B, C or D) and the S key indicator light remains on. When the S key is pressed again, the chair will move back to the position in which it was when you first pressed the S key. (Default)

1 = Previous working position is cleared from the memory when the chair is driven from the spit position to an automatic position (A, B, C or D) and the S key indicator light goes off. When the S key is pressed again, the chair will move again to the spit position. Select this option when using the S position as an exit position.
Note that changing the chair's position in non-automatic mode will not clear the previous working position from the unit's memory.

n.79 Lift mechanism position sensor calibration mode (L --)

This service mode is used to calibrate the lift mechanism potentiometer. This needs to be performed if the pot is loosened from the motor or if the motor is replaced. Press the S key for 8 seconds until the LED in the key lights. Use the A and B keys to first align the mechanism. Loosen the potentiometer cogwheel and turn the pot axle until the segments align in the display. Tighten the cogwheel. For more detailed calibration instructions, please refer to 2.2 "Calibrating lift motor position sensor" on page F-20.
Note that during the calibration of the lift motor position sensor all software limits are ignored. Special care must be taken for not to damage the unit by driving the lifting adapter to its mechanical limits.

n.80 Backrest mechanism position sensor calibration mode (b --)

This service mode is used to calibrate the backrest potentiometer. This needs to be performed if the pot is loosened from the motor or if the motor is replaced. Press the S key for 8 seconds until the LED in the key lights. Use the C and D keys to first align the two marks in the mechanism. Loosen the potentiometer cogwheel and turn the pot axle until the segments align in the display. Tighten the cogwheel. For mo-re detailed calibration instructions, please refer to 2.1 “Calibrating backrest motor position sensor” on page F-18.
Note that during the calibration of the backrest motor position sensor all software limits are ignored. Special care must be taken for not to damage the unit by driving the backrest to its mechanical limits.

2.9 Separator/suction system related service modes

n 81 Show type of installed suction system(n mode = 0, 1, 2, 3, 4...)

This service mode displays the type of installed separator system (if any). The type of the separator system is automatically determined by the type of separator cable connected to the MCB (jumper wires).
0 = wet suction system or no separator system installed
1 = Microvac II dry suction system separator (manufactured by Planmeca, no amalgam separation)
2 = Dürr Combisep amalgam separator (manufactured by Dürr, centrifugal amalgam separation)
3 = Metasys (manufactured by Metasys, centrifugal amalgam separation)
4 = VSA suction motor/amalgam separator combination (manufactured by Dürr, stand alone system)
5..7 = reserved

n.82 Set suction motor turn-off delay (n mode = Cont, 00.03... 30.00)

This service mode sets the turn-off delay for the suction motor controlled (optionally) by the unit. The factory default is 00.03 (three seconds). This turn off delay protects the suction motor from repeated start /stop cycles. Setting the mode to “Cont” (continuous) would start the suction motor immediately when the unit is turned on, and turn off the motor automatically when the unit is turned off. Any other setting would keep the suction motor running as long as indicated, after the suction hoses are put back to their holders.

The turn-off delay for the suction hoses is used also for the Dürr spittoon bowl valve.

n.83 Set number of suction hoses / disable suction system (n mode = 0, 1, 2, 3)

This service mode tells the unit how many simultaneous suction hoses are installed in the unit. The unit needs to know this detail so it can determine when to turn off the suction system and the suction motor. The following settings are possible:

0 = no suction system installed (no suction hoses, ignores all related possible error messages)
(used also with independent suction system)
1 = one suction hose only
2 = two suction hoses (factory default)
3 = three suction hoses (mainly USA, using extra T-branch adapter)

n.84 Set type of extra assistant instrument

Use this service mode to set the type of the (optional) installed assistant instrument (rightmost location in the suction hose holder and additional holders).

0 = no extra assistant instrument (this location in the holder is available for a suction hose)
1 = assistant’s syringe installed
2 = water operated saliva ejector installed
3 = assistant syringe and water operated saliva ejector installed
4 = PM Starlight LED polymerization light
5 = assistant’s syringe and PM Starlight
6 = water operated saliva ejector and PM Starlight
7 = assistant’s syringe, water operated saliva ejector and PM Starlight

This service mode is also affected automatically by the service mode factory preset.

2.10 MCB CPU direct I/O related service modes (for factory use)

These service modes are for factory use.

n 85 Show IC36 output signals

1st vertical segment (counting from right): WMS use, see service mode 126
2nd: Not in use
3rd: Saliva suction selective valve
4th: High power suction selective valve
5th: Intracam activated
6th: Microvac pulse valve
7th: Main water valve
8th: Glass fill valve

n 86 Show IC37 output signals

1st vertical segment (counting from right): Assistant syringe water valve
2nd: Assistant syringe heater
3rd: Metasys/Dürr error acknowledge signal or Dürr VSA rinse valve
4th: Metasys/Microvac/Dürr start signal or Dürr VSA/Wet suction valve
5th: Water flush to suction system
6th: Ejector control
7th: Bowl rinse control
8th: Main air valve

n 87 Show IC29 driver signals

1st vertical segment (counting from right): Power source control
2nd: Beeper control
3rd: Boiler control
4th: Assistant call / door open / Intracam control relay
5th: Suction motor relay
6th: Bacrest movement reversion relay
7th: Lift motor movement reversion relay
8th: Instrument reverse rotation

n 88 Show IC31 driver signals

1st vertical segment (counting from right): Scaler electronics activated
2nd: Status LED / Run LED control
3rd: Factory use
4th: Factory use
5th: Not in use
6th: Not in use
7th: Not in use
8th: Not in use

n 89 Show IC14 input signals

1st vertical segment (counting from right): Microvac overfill error
2nd: Metasys/Dürr functional
3rd: Metasys/Dürr separator alarm or Dürr VSA float reed relay signal
4th: Factory use
5th: Operation light switch
6th: Cuspidor door switch
7th: Metasys separator beeper
8th: Factory use

n 90 Show IC16 input signals

1st vertical segment (counting from right): Scaler electronics selection 1
2nd: Scaler electronics selection 2
3rd: Scaler electronics selection 3
4th: Separator selection 1
5th: Separator selection 2
6th: Separator selection 3
7th: WCS container recognition
8th: Patient glass fill button

n 91 Show port A outputs (IC4)

1st vertical segment (counting from right): Not in use
2nd: Not in use
3rd: Backrest motor control
4th: Lift motor control
5th: Chair control

n 92 Show port A inputs (IC4)

1st vertical segment (counting from right): Factory use
2nd: Emergency switch
3rd: Factory use

2.11 Other service modes

n.93 Adjustment of the duration of the spray water impulse

This service mode can be used to adjust the duration of the spray water impulse. The use of this water impulse is explained in section “n 95 Set spray water impulse pressure” below. The adjustment range is 0 - 20 (correspond to 0.00 - 1.20 sec.), and the factory default is 1 (corresponds to 60 ms).

n.94 Set syringe fibre optic light voltage

This service mode can be used to alter the voltage of the syringe fibre optic light. The range is 0 - 4 V, and the factory default is 3.7 V.

n.95 Set spray water impulse pressure

This service mode can be used to adjust the minimum pressure of the spray water impulse. If you use only a very small amount of spray water there might be a delay in the spray water flow. However, you can adjust the water impulse pressure so that the spray water channel is opened immediately to enable the water to flow without delay. After the opening impulse, the spray water pressure is taken to the value adjusted when programming the amount of water for spray. The range is 0 - 30 (compare to spray water settings where 0 = “SH.00” and 30 = “SH.30”), and the factory default is 15.

n.96 Enable low speed function for rotating instruments (Optional Plus package)

This service mode can be used to enable/disable the (optional) low speed function for rotating instruments.

1 = low speed function for rotating instruments enabled
0 = low speed function for rotating instruments disabled

The factory default is 0.

n.97 Set suction system cleaning time

This service mode can be used to adjust the cleaning time for the suction system. The available range is between 0 sec. (no flushing) and 20 min, and the factory default is 2 min.

n.98 Select how to freeze Intracam image from foot control

This service mode is used to select how Intracam images are frozen using the foot control.

0 = sideways movement of the pedal has no effect
1 = pedal movement activates the door open/nurse call relay (video printer freeze)
2 = pedal movement activates the serial communication connection (2400N81) to Dimaxis
Pushing the pedal to the left will freeze the image, pushing it to the left again will unfreeze the image.
Pushing the pedal to the right will save the image.
3 = pedal movement activates both the door open/nurse call relay and the Dimaxis serial communication (1 + 2).

The factory default is 2.

4 - 7 are the same as 0 - 3 but the pedal operation is vertical.

n.99 Instrument hose flushing operation: disable HE 99 message

The user can select either a short or a long instrument hose flushing. Use this service mode to enable/ disable the HE99 message.

In case the long flushing is not performed prior to unit turn-off:
0 = HE99 is not displayed
1 = HE99 will be shown, but the unit can be used without performing the long flushing.
2 = HE99 will be shown and the long flushing must be performed before the unit can be used.

The factory default is 0.

n.100 Select dental unit type (n mode = 0, 1, 2, 3, 4, 5, 6, 7)

This service mode is used to select the dental unit type.

0 = Prostyle Compact unit without chair
1 = Prostyle Compact unit
2 = Prostyle Compact WE'S unit
3 = reserved for future use
4 = Planmeca Compact e
5 = Planmeca Compact i without chair
6 = Planmeca Compact i
7 = Planmeca Compact e with swivel position recognition
---- = unit type not selected

The factory default is 6.

After replacing the Main PCB the dental unit automatically enters to this service mode when unit is switched on. The unit type must be selected before it can be used.

n.101 Interrupt waterline cleaning operation (n = 0, 1, 2, 3, 4, 5, 6)

This service mode is used to check the state of the waterline cleaning operation.

0 = Normal operation; the waterline cleaning operation off.
1 - 6 = The waterline cleaning operation on. Different numbers present different phases:
1 = The waterline cleaning operation started. Waiting for the instrument logic to notify the operation start.
2 = The instrument logic has notified the operation start. The unit checks which doriot arms are bent or removed. The unit is waiting for the container to be installed. Spreading the cleaning solution to the system.

3 = The cleaning solution has filled the instrument waterlines and the glass filler line. The unit is waiting for the container to be removed and filled with water. After attaching the container to the unit the flushing of the unit is being carried out.
4 = The rinsing cycle is ready. Waiting the container to be removed.
5 = Performing the final flush operation to clean the container properly. Going to the normal operation state (number 0) after this.
6 = Some failure or error or user operation has occurred that might leave the unit dirty and the unit must be flushed by pressing the flush button. Going to the normal operation state (number 0) after this.

Whenever wanted, by pressing and holding down the S-key the waterline cleaning operation can be interrupted. After interrupting the operation the text "turn off" will flash on the display. Now turn off the unit.

The factory default is 0.

n.102 Disable dry spray mode when using Plus Package (0, 1, 2)

This service mode is for disabling dry spray mode from the instruments when using Plus Package. 0 = dry spray mode enabled, 1 = dry spray mode disabled, Plus package signal tones, 2 = dry spray mode disabled, normal signal tones.

The factory default is 0 (dry spray mode enabled).

n 103 Show the dental unit type (nn)

First digit shows type of Main PCB:
2 = Planmeca Compact i

Second digit shows IMUX version:
0 = no IMUX
1 = IMUX PCB version E or older
2 = IMUX PCB version F-G (1.08.x)
3 = IMUX PCB version F-G (1.09.x or 1.10.x)
4 = IMUX PCB version H or never

Third digit shows dental unit type:
0 = Prostyle Compact
1 = Planmeca Compact e
2 = Planmeca Compact i

Fourth digit shows patient chair type:
0 = no patient chair
1 = Prostyle Compact chair without legrest or legrest up
2 = Prostyle chair with legrest down
3 = WE'S lifter
4 = Planmeca Compact e chair
5 = Planmeca Compact i chair with fixed legrest; or automatic legrest up
6 = Planmeca Compact i chair with 510 automatic legrest; in automatic state
7 = Planmeca Compact i chair with 460 automatic legrest; in automatic state
8 = Planmeca Compact e with swivelled position recognition and fixed legrest
9 = Planmeca Compact e with swivelled position recognition and automatic legrest
A = Planmeca Compact e swivelled to 90° with automatic legrest

NOTE ***The Planmeca Compact i chair with automatic legrest can be either number 5 or 6/7; it is number 5 if the legrest is locked up, and it is number 6/7 when the legrest is moving synchronously with the backrest.***

n.104 Instrument multiplexer additional water valve control (0,1,2,A)

This service mode is for enabling the instrument multiplexer additional water valve control.

0 = disabled
1 = reserved for factory use
2 = enabled (default)
0 - 2 are for IMUX PCB version G
A = automatic
A is for IMUX PCB version H

n.105 Enable/disable instrument places (IIIII signal)

In this service mode you can enable/disable instrument places. The different setting combination can be and scrolled and selected by using the "A"- and "B"-keys. The display shows a short line on the place where the instrument place is disabled e.g. **(IIıII)**. **Note, that the syringe cannot be disabled.**

n.107 Triggering level of Er45 adjustment

In this service mode you can adjust the triggering level of Er45 if the low external water pressure is a problem. The default value is 17 which corresponds with the spray water pressure of 1.7 bar. The adjustment range is 1 - 17 in steps of 1.

n.108 Stopping delay for instrument spray air (0, 1, 2, 3, 4,..15)

This service mode is for setting the air flow delay after the water stop on the instrument. Every step equals to 65 ms more delay.

0 = no delay
1= 65 ms
2 = 130 ms
3 = 195 ms
4 = 260 ms (default)
.
.
15 = 975 ms

n.109 Unit type setting to enable or disable the IMUX and the door features (0, 3, 28, 31, 44, 47)

This service mode is used to enable or disable the IMUX and the door safety features if needed. **Factory default is either 0 or 3 depending on the unit type selection in service mode 100.**

0 = Compact i (**nor**)
3 = Compact e (**Co.E**). Door switch ignored.
28 = Cart (**CArt**). No error messages but text "CArt" displayed if IMUX disconnected.
31 = Independent Cart (**In.CA**). Door switch ignored and no error messages but text "*CArt*" displayed if IMUX disconnected.
44 = No instrument console (**nol.C**). No error messages nor text "*CArt*" displayed if IMUX disconnected. Glass filling and bowl rinsing get water, assistant syringe gets water and air and its **heater can be powered on and water heater can be powered on** even IMUX is disconnected.

n 110 Show IC39 outputs

1st vertical segment (counting from right): WMS use
2nd: WMS use
3rd: Factory use
4th: Factory use
5th: Factory use
6th: Factory use
7th: Factory use
8th: Factory use

n 111 Show inputs IN3 (IC39)

1st vertical segment (counting from right): WMS use, see service mode 126
2nd: WMS use, see service mode 126
3rd: WMS use, see service mode 125
4th: Bowl above patient chair
5th: Glass recognition
6th: WMS use, see service mode 125
7th: Chair type input 0
8th: Chair type input 1

n 112 Show inputs IN4

For factory use.

n 113 Show side delivery arm emergency switches signals (0, 1)

This service mode is used to check the operation of the up and down emergency stop switches of the side delivery arm. The display should normally show D0U0 if nothing is touching the switches (switch closed) and the cable and connectors are OK. Pushing the switches must change the display to 1 (one) (switch opens). A continuous open circuit in the cables would also cause the display to show D0U1.

n 114 Show bowl position (0, 1)

This service mode shows the bowl position. 0 = bowl is not in rest position, the chair cannot be driven upwards. 1 = bowl is in rest position.

n 115 Show glass identification signal (0, 1)

This service mode shows the glass identification signal. 0 = The glass sensor does not identify the glass and the glass filling is not activated (no water flow). 1 = Glass is in the holder and glass filling is activated when pressing the glass fill key.

n.116 Select glass filling mode (0, 1, 2)

Use this mode to select the glass filling mode. The following settings are possible:

0 = Glass sensor is not used, i.e. the water will flow even if the glass is not in holder.
1 = Glass filling does not start if the glass is not in the holder.
2 = Glass filling starts automatically when the glass is placed to the holder and stops when the glass is removed or when the filling time runs out.

Factory default is 1.

n 117 Show active time of drive air pulse width modulation

For factory use.

n 118 Show active time of spray water pulse width modulation

For factory use.

n 119 Show active time of spray air pulse width modulation

For factory use.

n 120 Show active instrument power consumption

This mode is used to check the power consumption (in Watts) of the active instrument. Note that the error in the reading is ±15%.

n.121 Select the length of the automatic legrest (0, 1, 2)

Use this mode to select the length of the automatic legrest. The following settings are possible:

0 = 510 mm long legrest
1 = 460 mm long legrest
2 = 390 mm long legrest

The factory default is 0.

n.122 Factory test

Reserved for factory use.

n.123 Factory test

Reserved for factory use.

n.124 Set the type of Planmeca Compact i

This service mode is used to select the G Compact i dental unit:

0 = Normal Planmeca Compact i
1 = G Compact i

Factory default is 0.

n 125 Show Water management system status

This service mode shows the Water management system (WMS) status.

First digit shows the container status:
0 = Status unknown
1 = Pressurized, water level stable or lowering
2 = Pressurized, container fills up slowly, water level stable or lowering
3 = No pressure, container fills up quickly
4 = Unknown pressure status, water level stable or lowering
5 = No pressure, siphon

Second digit shows the WMS status:
0 = Status unknown
1 = Domestic water mode
2 = Clean water mode
3 = Cuspidor door open
4 = Cuspidor door just closed

Third digit shows the water level in the container
0 = Unknown
1 = Below lower limit (empty)
2 = Between lower and upper limit (normal)
3 = Over upper limit (full)

If there is only a line in the display, the WMS is not identified.

n 126 Show Water management system inputs and outputs

This service mode shows the WMS output and input signals.
1st vertical segment (counting from right): Input, Clean water valve
2nd: Input, Container and pump ON switch
3d: Input, Clean water mode switch
4th: Not in use.
5th: Output, Clean water disable valve drive
6th: Output, Container valve drive
7th: Output, Pump drive
8th: Output, Pump drive enabled

n.127 Water management system water flow adjustment

In this mode the water flow of the Water management system is adjusted.

Check the water flow and adjust the flow by turning the adjustment knob located on the magnetic valve/pressure regulator assembly. The water flow can be stopped by pressing the A-key.

Press the B-key briefly and let the water run for one minute. Pour the water into a glass measure.

The water flow must be:
Metasys typ1 and Compact, Microvac, no suction: 330 - 400 ml / min.
Dürr and Dürr VSA systems: 400 - 500 ml /min.

n.129 Adjustment of the upper limit of preprogrammed chair positions

In this service mode it is possible to adjust the upper limit of the preprogrammed chair positions. Adjustment range is 191…212. The range of the lift motor potentiometer signal is 0…255. In manual operation the maximum value is 240.

The current value from the lift motor potentiometer can be checked from SM 76.

Factory default depends on the chair type, which is shown in the service mode 103, digit 4.

n.130 Disable WCS (0, 1,2)

In this mode the Waterline cleaning system (WCS) operation can be disabled:

0 = WCS in use (factory default)
1 = Starting of WCS disabled, stafety features still active
2 = WCS totally disabled, i.e. also safety features are disabled.

n.131 WCS: adjustment of the syringe cleaning solution filling time (30 ... 40 ... 180)

In this service mode the WCS cleaning solution filling time of the syringe can be adjusted. From the software version 2.84 the syringe is filled with the cleaning solution first, before other instruments.

This filling time is adjustable because sometimes it might be impossible to know which kind of water flow the dental unit has inside. The water flow variation can be compensated by adjusting the syringe filling time so that the cleaning solution will flow through the syringe hose.

The adjustment range is 30 - 180 seconds. Factory default is 40 seconds.

Chapter

D

HELP & ERROR MESSAGES

1 HELP MESSAGES

1.1 General about help messages

The help messages are intended to assist the user in special situations. A help message usually indicates a user error rather than a system error or malfunction. The help messages mainly cover the following areas:

- violations against built in security functions
- warnings about amalgam collectors that needs to be emptied
- controls or keys with no response in certain situations
- erroneously attached instruments
- notifying the user of abnormal conditions that cannot be categorized as errors.

The help messages appear on the display as capital letters “HE” followed by a number. The message stays on the display only as long as the reason for it continues. The unit is otherwise fully functional, except for the reported problem. Only one help message is shown at a time.

After the unit has been updated with the latest version of the MCB software it may report a help message that is not listed in this manual. In this case, please request a new revision of the manual. The following table is a list of currently available help messages and their reasons.

1.2 Help message short-form table

Help Code	Meaning	Action or Explanation
HE 1	Amalgam container is 95% full (only Metasys or Dürr).	Replace or empty the container as soon as possible, or at least before the next patient. Pressing the program key allows to continue the operation until the container is 100% (totally) full. See User’s manual for details.
HE 2	Amalgam container is 100% full (only Metasys or Dürr).	Replace or empty the container immediately. The suction system cannot be used before the container is emptied or replaced. See the User’s manual for details.

Help Code	Meaning	Action or Explanation
HE 3	The patient chair cannot be driven down because the emergency switch is activated.	Check that the space under the seat is free and nothing is touching the plate at the bottom. The chair can be driven normally after the possible obstruction has been removed.
HE 4	This left-hand instrument position allows only a syringe.	The leftmost position in the console is reserved for syringe only. Please replace this instrument with a syringe. Place the other instrument to one of the four right-hand places.
HE 5	This instrument position does not accept a syringe.	Please remove the syringe from this position and replace it with any other kind of instrument. The syringe must be placed to the left-hand place.
HE 6	The patient chair cannot be driven when an instrument is in use.	Stop the instrument (release the foot pedal) to be able to run the chair.
HE 7	The patient chair up/down movement is not allowed when the cuspidor door is open. Only the manual backrest movement is allowed.	Close the cuspidor door to be able to run the chair up/down or to a pre-programmed position.
HE 8	The seat height can not be programmed this high in automatic positions for patient safety reasons.	Please run the chair slightly down to be able to program this position into memory.
HE 9	This scaler cannot currently be used with this unit.	This scaler needs a dedicated electronics that is not installed, or the scaler electronics installed is not compatible with this scaler.
HE 10	Please wait while configuring the dental instrument setup.	Please wait a few seconds for the unit to check your instrument configuration, since it has changed.
HE 12	The unit's internal error reporting is disabled.	The unit operates normally but no errors are reported (exhibition use). Use service mode 15 to turn the error reporting back on. See page C-17 for details.
HE 13	The instrument cannot run because of a patient security violation.	Please return the foot control pedal once to the middle position to start the instrument. Instruments do not start if the foot control pedal is already pushed to the right or left when the instrument is taken out from the holder.
HE 14	This dental instrument is not recognized by the unit's control system (new type of instrument).	To be able to operate this new instrument the MCB software must be updated. See 5.1 "How to replace/upgrade the software" on page G-16 for details.
HE 15	This key has no function at this moment.	Instruments: Please pick up a dental instrument before attempting to alter its settings; or if the instrument is selected, this function is not allowed with this instrument. Other keys: the unit does not have this function.

Help Code	Meaning	Action or Explanation
HE 16	The operating light is currently dimmed on purpose.	This feature enables easier work with composite materials, minimizing the risk of operating light induced curing. This feature is triggered by picking and returning the curing light to its holder without starting it. The operating light returns to normal at the same instance any control is touched or another instrument selected. The feature can be disabled, see page C-29 for details.
HE 17	There is no syringe connected to the instrument console.	The console syringe must be re-connected, otherwise there is an air-leak from the syringe QC whenever an instrument or device that requires air pressure is used.
HE 18	There is no instrument hose connected to this instrument place (this doriot arm).	The instrument is picked out, but there is no hose connected at this location.
HE 19	There is no syringe connected to the connector located on the cuspidor.	The nurse syringe must be re-connected, otherwise there is an air-leak from the nurse syringe QC whenever an instrument or device that requires air pressure is used. Install syringe or disable syringe using service mode “n.084”.
HE 20	The connector located on the cuspidor allows only a syringe, other instruments can not be connected to this connector.	The nurse syringe QC cannot control the currently connected instrument.
HE 21	The flow of both the spray air and spray water are programmed to zero (no flow).	Enter the spray programming mode to set a flow other than zero, see 4.2 “Instrument spray flow rates” on page B-4 for details.
HE 22	The main air/water valve operation is selected to be on (n=1) or off (n=0) in the service mode 12 (air)/13 (water). The operation must be selected to be automatic (n=A).	This is just a reminder that either of the main valves is set temporarily to be either always on or off.
HE 23	The automatic/manual chip blow can not be used when the sterile water function is selected.	
HE 24	The selected setting can not be programmed.	The programming of the selected setting is disabled. Disable the protection using service mode “n.000”. See page C-14 for details.
HE 25		
HE 26	Compact WE’S help message, should not appear in Compact i: The chair backrest cannot be driven down, the seat is too low.	Drive the seat upwards before lowering the backrest. If this help message is shown while the patient chair is attached to the unit, it means that you have forgotten to switch on the chair’s automatic positions. To clear the message, put the operation mode switch on the cuspidor side of the chair base in the “AUTO” position (switch up).

Help Code	Meaning	Action or Explanation
HE 27	Compact WE'S help message, should not appear in Compact i: The chair seat cannot be driven down, the backrest is too low.	Drive the backrest upwards before lowering the seat. If this help message is shown while the patient chair is attached to the unit, it means that you have forgotten to switch on the chair's automatic positions. To clear the message, put the operation mode switch on the cuspidor side of the chair base in the "AUTO" position (switch up).
HE 28	Compact WE'S help message, should not appear in Compact i: The patient chair cannot be driven up/down because the lifter cable is not connected.	Connect the lifter cable.
HE 29	Compact WE'S help message, should not appear in Compact i: The chair backrest cannot be driven down, the seat is too high.	Drive the seat downwards before lowering the backrest. If this help message is shown while the patient chair is attached to the unit, it means that you have forgotten to switch on the chair's automatic positions. To clear the message, put the operation mode switch on the cuspidor side of the chair base in the "AUTO" position (switch up).
HE 30	The unit is waiting for the container to be attached.	Attach the container (or make the long rinse cycle or use service mode "n.101").
HE 31	The unit's power can now be turned off.	Turn off the unit if needed. When the unit is turned back on, remove the container, fill it with water and attach it again to the unit (or make long rinse cycle or use service mode "n.101").
HE 32	The pre-rinsing cycle is completed and the container should be removed.	Remove the container (or make long rinse cycle or use service mode "n.101").
HE 33	The unit is waiting for the main water to be turned on.	Remove the container and open the tap (or make long rinse cycle or use service mode "n.101").
HE 34	No instruments were selected when starting the waterline cleaning operation.	Select (remove from holder, twist doriot) at least one instrument (not syringe).
HE 35	The instruments are locked for safety reasons.	Press the instrument spray key to perform the instrument flushing.
HE 36	After flushing (short, long or Waterline Cleaning System): Remove the syringe from the flushing holder and return it back. If the syringe is already removed, return it back to the flushing holder. This ensures that no water will flow from the syringes after flushing.	
HE 37	The Waterline Cleaning System cycle has been interrupted.	
HE 38	Waterline cleaning system help message: Low water pressure during the final rinsing.	
HE 39	Waterline cleaning system help message: Make sure that the syringe is properly positioned in the flushing holder before the WCS procedure.	The help message will disappear after bending the syringe instrument arm and returning it back to its holder.

Help Code	Meaning	Action or Explanation
HE 50	No glass in the glass holder. The glass sensor does not recognise the glass when pressing the glass fill key.	Place a glass to the glass holder. Or change the setting of the service mode 115.
HE 51	The bowl is above the patient chair when driving the chair up.	Move the bowl to the rest position.
HE 52	The patient chair can not be driven upwards because the emergency switch of the side delivery arm is released.	
HE 53	The patient chair can not be driven downwards because the emergency switch of the side delivery arm is released.	
HE 54	Glass is inserted in the glass holder.	Remove the glass.
HE 60	Water management system (WMS): Container almost empty in domestic water supply mode.	Reduce water usage for a moment.
HE 61	WMS: Container almost empty in Clean Water mode.	Reduce water use and fill up the container as soon as possible.
HE 62	WMS: The Container switch is turned off.	Switch on the container switch.
HE 63	Cuspidor door is open.	Close the door.
HE 64	Fill the container with disinfectant over the upper sensor.	
HE 65	Fill the container with water over the upper sensor.	
HE 66	Wait 8 hours or switch the unit off for the night.	
HE 70	The brushless micromotor is stucked or broken.	
HE 99	The unit has been switched off without performing the long flushing after water has been used. The help message will disappear after the long flushing is performed.	This help message can be disabled, see page C-36 for details.
End	Flushing is completed. After flushing (short, long or Waterline Cleaning System): Remove the syringe from the flushing holder and return it back. If the syringe is already removed, return it back to the flushing holder. This ensures that no water will flow from the syringes after flushing.	
Door	WMS: Cuspidor door is open.	Close the door.

2 ERROR MESSAGES

2.1 General about error messages

The error messages are intended to assist the technician in situations were the control system detects a condition that could be a possible fault. An error message usually indicates a system error or malfunction rather than a user error. The error messages cover the following areas:

- insufficient pressures to control the instruments or other pneumatic problems
- failed (open or short circuited) cables and/or valves
- printed circuit boards not functioning properly
- failed bulbs and/or fuses
- power supply failures or problems
- non-compatible printed circuit boards or software versions
- sensor and switch failures
- other miscellaneous errors.

The error messages appear on the display as a capital letter “E” followed by a number (“n.n”). The number (left side of decimal point or if no decimal at all) indicates the type of error. Some error messages also have a decimal part (number on the right side of decimal point). This decimal part determines in more detail the reason for the error.

The error message stays on the display only as long as the error exists. In the case of several simultaneous errors, the display shows them one at a time, in ascending number order. The unit is otherwise fully functional, except for the reported error(s). Error messages are **not** stored internally for later retrieval.

After the unit has been updated with the latest version of the MCB software it may report an error message that is not listed in this manual. In this case, please request a new revision of the manual. The table on the following pages is a list of currently available error messages and their meanings. For a detailed description of the error messages please refer to the indicated pages.

2.2 Disabling/enabling error messages

The error reporting system can be disabled (service mode 15). This is useful in exhibitions or showrooms when a complete installation cannot be made (missing vacuum, water or air supply). In these cases the errors **should be disabled** so that the unit does not unnecessarily show error messages on the display.

The unit briefly flashes an “HE 12” message on the display at power-on, to remind that the error message system is disabled. Please refer to service mode “n.15 Disable error messages (n mode = 0, 1, 2)” on page C-17 for details how to enable/disable the error message system.

2.3 Error message short-form table

Error	Explanation	Details on:
GENERAL		
E1.nn	Output (Valve/Aux) short circuit on MCB.	page D-10
E2.nn	Output (Valve/Aux) open circuit on MCB.	page D-10
E3.n	Internal pressure (water and/or air) problem.	page D-11
E4.n	Short circuit in the cable from the MCB to the control panel/suction holder in branch n.	
E5	reserved	
E6	reserved	
POWER SUPPLY RELATED		
E7	IPS (Instrument Power Supply) voltage failure on MCB.	page D-11
E8	reserved	
E9	Internal operating voltage too low (or mains < 15% under nominal rating).	page D-12
E10	Internal operating voltage too high (or mains >15% over nominal rating).	page D-12
E11.n	Fuse is blown on MCB.	page D-12
E12	reserved	
E13	Mains frequency is outside acceptable range (< 47 or >63 Hz).	page D-12
E14	IPS heatsink temperature measurement sensor error.	page D-12
E15	IPS heatsink running too hot on MCB (heatsink not attached properly to electronics box).	page D-12
E16.n	Attached scaler electronics is of new type.	page D-13
E17	reserved	
E18	reserved	
CONTROL PANEL RELATED		
E19.n	Control panel is of new type, update software on MCB.	page D-13
E20.n	Control panel key is stuck during selftest.	page D-13
E21	reserved	
E22	reserved	
INSTRUMENT RELATED		
E23	Polymerization (light curing) light bulb is overheated, blown, or not in the socket.	page D-13
E24	reserved	
E25	Satelec mini L.E.D. polymerization light requires IMUX PCB version F or later.	page D-13
E26	reserved	

Error	Explanation	Details on:
E27	reserved	
INSTRUMENT MULTIPLEXER RELATED		
E28.n	Error in instrument hose identification system in IMUX.	page D-14
E29	Voltage error in fibre light power supply in IMUX.	page D-14
E30	reserved	
E31	reserved	
E32.n	Error in serial communication between MCB and IMUX.	page D-14
E33.n	IMUX output short circuit (valve or wire short circuit).	page D-15
E34.n	IMUX output open-circuit (valve or wire open-circuit).	page D-15
E35.n	IMUX pressure sensor offset error (signal outside range).	page D-15
E36.n	IMUX pressure sensor error (signal voltage too high).	page D-16
E37	Pressure sensor cable not properly attached to the IMUX.	page D-16
E38	reserved	
E39	Drive (cooling) air valve control servo cannot maintain pressure to instrument.	page D-16
E40	reserved	
E41	reserved	
E42	Air coolant (spray air) valve control servo cannot maintain pressure to instrument.	page D-16
E43	reserved	
E44	reserved	
E45	Water coolant (spray water) valve control servo cannot maintain pressure to instrument.	page D-17
E46	reserved	
SUCTION TUBE HOLDER RELATED		
E47.n	Suction tube holder is of new type. Update the MCB software.	page D-17
E48.n	Number of attached suction tube holders is wrong.	page D-17
E49.n	Suction tube holder cable or electronics is faulty.	page D-17
E50	reserved	
FOOT CONTROL RELATED		
E51.n	Cable from the foot control is loose	page D-18
E52	Foot control is of a new type. Update software on MCB.	page D-18
E53	Foot control serial communication (data) failure.	page D-18
E54.n	Foot control is not properly calibrated.	page D-18
E55	reserved	

Error	Explanation	Details on:
OPERATING LIGHT RELATED		
E56	OP-light is erroneously connected (bulb and push-button cross-connected).	page D-19
E57	reserved	
E58	reserved	
SEPARATOR SYSTEM RELATED ERROR MESSAGES		
E59.n	The separator (only Dürr or Metasys) is reporting an functional error.	page D-19
E60	The separator (only Dürr or Metasys) is not responding or the cable is faulty.	page D-19
E61	The separator is flooded (only Microvac) with too much water.	page D-19
E62	The newly attached separator is of unknown type. Please update the MCB software.	page D-19
E63	reserved	
PATIENT CHAIR RELATED ERROR MESSAGES		
E64	Seat position potentiometer or its cable is faulty or disconnected.	page D-20
E65	Lift motor does not run or no signal from position sensing potentiometer.	page D-20
E66	Lift motor or its position pot cable has a wrong connection.	page D-20
E67	Backrest position potentiometer or its cable is faulty or disconnected.	page D-20
E68	Backrest motor does not run or no signal from position sensing potentiometer.	page D-20
E69	Backrest motor or its position pot cable has a wrong connection.	page D-21
E70	reserved	
E71	reserved	
MCB CPU RELATED ERROR MESSAGES		
E72.n	Software chip (EPROM or Flash-EPROM) error.	page D-21
E73.n	CPU internal EEPROM error.	page D-21
E74.n	RAM error.	page D-21
E75.n	Program structure error, please contact PLANMECA.	page D-21
E76	reserved	
E77	Error in communicating with external serial device.	page D-21

3 DETAILED DESCRIPTION OF ERROR MESSAGES

3.1 General error messages

E 1.nn Output short circuit on MCB

All valve and extra outputs on the MCB are short-circuit protected. Additionally, the MCB CPU system is able to read the signal levels on the output pins. Therefore the following detailed information can be presented about the possible short circuit.

E 1.01 Main water valve short circuit
E 1.02 Main air valve short circuit
E 1.03 Bowl rinse valve short circuit
E 1.04 Cup filling valve short circuit
E 1.05 Water flush valve short circuit
E 1.06 Separator pulse valve short circuit (only with Microvac's)
E 1.07 Ejector valve short circuit (only if defined as an option)
E 1.08 Extra out 1 short circuit (High volume membrane valve, reserved)
E 1.09 Extra out 2 short circuit (Saliva suction membrane valve, reserved)
E 1.10 Extra out 3 short circuit (Reserved)
E 1.11 Separator start signal/Microvac's start valve short circuit
E 1.12 Assistant syringe water valve short circuit
E 1.13 Separator alarm reset signal short circuit
E 1.14 PLANET output (ELMP) short circuit

These errors can only be detected when the circuit is active.

Disconnect the valve or output indicated and check if the error disappears. Otherwise the problem must be in the cable, or as the last possibility, on the MCB. If the error does not disappear even if the valve cable at connector P16 on the MCB is disconnected, then the MCB must be replaced. Advanced: Replace both IC37 and IC36 on the MCB.

E 2.nn Main Control PCB output open circuit warning

The following list indicates which output is causing the trouble;

E 2.01 Incoming water valve open circuit
E 2.02 Incoming air valve open circuit
E 2.03 Bowl rinse valve open circuit
E 2.04 Cup filling valve open circuit
E 2.05 reserved
E 2.06 Separator pulse valve open circuit (only with Microvac's)
E 2.07 reserved
E 2.08 reserved
E 2.09 reserved
E 2.10 reserved
E 2.11 Separator start signal open circuit / Microvac valve open circuit
E 2.12 Assistant syringe water valve open circuit
E 2.13 Separator alarm reset signal open circuit
E 2.14 reserved

These errors can be detected when the circuit is dead.

Disconnect the connectors at the end of the indicated bad valve (load). Measure with an ohmmeter that the valve resistance is in the range 50-300Ω. Disconnect the valve connector P16 on the MCB and check the condition on the indicated valve cable wires. Check that both the disconnected wires are OK all the way to P16.

E 3.n General pressure problem

E 3.1 Incoming air pressure compared to the water pressure is too low

The internal air pressure (after the internal pre-regulator) must always be 100kPa higher than the internal water pressure (after the internal pre-regulator). Otherwise the membranes in the IMUX doesn't close properly. Normally this never causes a problem, except for the cases when the system compressor is accidentally turned off during the use of the unit. Check that the incoming pressure is according to specifications. Also measure (and readjust if necessary) the internal pressures of the unit. Use either an external manometer attached to the syringe, or use the internal service mode system for the check. Check also the condition of the water and air filters. Look for any kinks in the air tube going to the IMUX.

E 3.2 reserved
E 3.3 reserved
E 3.4 Internal air pressure (after pressure regulator) is too low
E 3.5 Internal air pressure (after pressure regulator) is too high

Check the condition of the input pressures to the unit. Is an external valve or compressor accidentally closed? Check the water and air filter. Check (and readjust if needed) the internal pressures.

E 4.n Short circuit in the cable from the MCB to the control panel/ suction holder in branch n

E 4.1 Short circuit in the cable from the MCB to the control panel/suction holder in branch 1
E 4.2 Short circuit in the cable from the MCB to the control panel/suction holder in branch 2

The problem must be in the cable, or as the last possibility on the control panel PCB or suction holder PCB or MCB. Localize the short circuit in the cable, and repair the cable or replace it. If the error does not disappear, then the control panel PCB or suction holder PCB or MCB must be replaced.

E 5, 6 reserved

3.2 Power Supply related error messages

E 7 IPS voltage failure on MCB (IPS = Instrument Power Supply)

The IPS output voltage is too high. Disconnect the P3 (cable to the IMUX) on the MCB. If the error is still there, then the MCB IPS power supply is faulty. Advanced: Check the condition of Q6, Q9 and Q7 on the MCB.

If the MCB is OK; check the condition of the IMUX (8-wire) cable by disconnecting it both at the IMUX and MCB. Measure all wires for shorts between each others as well as the chassis. Replace the cable or the IMUX.

E 8 reserved

E 9 Internal operating voltage too low

Check first the mains voltage at the input terminals (P25) on the MCB. If the error only occurs when running the patient chair then check that the mains impedance is not too high so that the incoming mains voltage does not drop under the minimum allowed. The following voltage variations are allowed to guarantee normal operation;

- 230 volt setting (Europe) mains can be from 187VAC to 265VAC
- 115 volt setting (USA) mains can be from 98VAC to 132VAC
- 100 volt setting (Japan) mains can be from 80VAC to 110VAC

If the incoming mains voltage is at any instance outside the indicated range then an external voltage stabilizer must be considered. Check that both fuses F9 and F10 on the MCB are OK. If the error still appears, especially in the lower range of the mains voltage, then the MCB must be replaced. Advanced: Check the condition of D9, D11, D14, D15, and components around the voltage measurement filter.

E 10 Internal operating voltage too high

Check first the mains voltage at the input terminals (P25) on the MCB. Do the same checks as above. Make sure that the voltage selector jumper is set properly.

E 11.n Secondary fuse blown on MCB

The conditions of the secondary fuses are indicated also by green LEDs at each fuse holder position. Please look at the inner side of the PCB edge. If a green LED is dark, then the respective fuse at that position is blown. The following list gives more details about the blown fuse. Please remember to replace the fuse with the same type and rating indicated, to guarantee safety of the equipment;

E 11.1 OP-light fuse (F5) and/or Water heater fuse (F7) is blown on the MCB
E 11.2 Separator fuse (F6) and/or the Syringe heater fuse (F8) is blown on the MCB
E 11.3 Either of the +24V electronics fuses (F9 or F10) is blown on the MCB

Always turn off the power during fuse replacement. If a fuse blows immediately again, try to disconnect the respective load (OP-light, Water heater, Separator or Syringe) to check whether the load itself is causing the problem.

E 12 reserved

E 13 Mains frequency outside acceptable range

The mains frequency is measured by the MCB and is needed to synchronize both patient chair AC motors and the OP-light operation. If the mains frequency is OK and the error still repeats (with possible OP-light flickering) then the MCB must be replaced. Advanced: Check R167, C82, R159, IC8-5 and IC8-6.

E 14 IPS temperature measurement sensor error

The voltage from the temperature sensor is outside the normal operating range. Check visually the board around the heatsink for any damage. Replace the MCB.

E 15 IPS heatsink is running too hot on MCB

All power semiconductors on the MCB are attached to the same heatsink. For proper cooling, this heatsink must be attached properly to the left side to the electronics control box. Check that the two screws are in place and tight. When the heatsink temperature reaches the maximum allowed (Ý60 °C) this error is generated. The CPU on the MCB first turns of the OP-light and secondly the output power to the dental instruments, if the temperature still rises a few degrees. This safety feature makes it impossible to overheat the MCB heatsink.

E 16.n Attached scaler electronics is of new type

The recently attached scaler electronics module cannot be used since the current version of the software on the MCB does not have up-to-date information. All other functions are in use, except for the new scaler. Update the MCB software.

E 16.1 New type of scaler electronics is attached to MCB
E 16.2 New type of scaler electronics is attached to IMUX

E 17, 18 reserved

3.3 Control panel related error messages

E 19.n Control panel is of new type

The recently attached new control panel is of a new type and cannot be controlled. Please also update the MCB software. Then decimal “n” indicates which control panel is of the new type.

E 19.1 Control panel in branch 1 is of new type
E 19.2 reserved (Control panel in branch 2 is of new type)

E 20.n Control panel key is stuck during selftest

When the power is turned on the unit checks that no keys are pressed in the control panel(s). The decimal “n” indicates which control panel(s) has the failed key.

E 20.1 Control panel 1 key stuck
E 20.2 Control panel 2 key stuck

E 21, 22 reserved

3.4 Instrument related error messages

E 23 Polymerization light bulb is blown or not properly attached to the socket

The MCB monitors the current flowing from the IPS to the curing light bulb. If the current is abnormally small then this error is generated. Check the bulb and the condition of the bulb socket. Some lights (LYSTA) have in series with the bulb connected a temperature fuse, that might have triggered (overheating). Check also the condition of the quick-connector pins. If it still doesn’t come on, check that the micromotor or the scaler operates to make sure that the cables in the arm between the MCB and IMUX are OK.

E 25 Satelec mini L.E.D. polymerization light requires IMUX PCB version F or later

The usage of the Satelec mini L.E.D. requires the IMUX PCB version F or later.

E 24, 26, 27 reserved

3.5 Instrument multiplexer related error messages

E 28 Error in hose identification system in IMUX

The hose ID measurement signal is out of bounds. If this error only occurs with one instrument; check the condition or corrosion of the quick connector pins. Replace the hose. Check visually the IMUX for any water leakage or corrosion on the PCB. Replace the IMUX if necessary.

E 28.1 Reference resistor signal out of bounds
E 28.2 Active instrument signal out of bounds
E 28.3 Syringe signal out of bounds

E 29 Voltage error in the fibre-light power supply in the IMUX

The fibre-light voltage regulator is not able to regulate the voltage to the fibre-light bulbs. During this error the instruments containing a fibre-light (turbines, micromotors and syringes) are not activated, to save the bulb from destruction. If this problem only occurs with one instrument then try first to replace the hose for this before replacing the whole IMUX.

E 30, 31 reserved

E 32.n Error in serial communication between MCB and IMUX

The communication between the MCB and IMUX is serial to reduce the number of wires to a minimum between these two. The MCB generates this error if there is any reason why it cannot communicate with the IMUX. Here are the reasons and remedies;

E 32.1 IMUX is not responding. IMUX cable disconnected or failure in cable or IMUX.

Check the two LEDs on the IMUX. If both are dark, check the cable at both ends. Disconnect the cable from both ends and measure all wires for shorts or opens. The green LED indicates (on IMUX) that the IMUX gets power from MCB. The yellow LED (when blinking) shows that the IMUX CPU is running and communicating with the MCB. Try with an external cable outside the arm, or try to connect temporarily another IMUX externally to check what is causing the problem.

E 32.2 IMUX software is not compatible (IMUX is of new type), with the MCB software.

A new IMUX has just recently been installed that has some new features that the MCB software cannot use. Please upgrade the MCB software. After the upgrade the MCB is still compatible with older versions of the IMUX as well.

E 32.3 IMUX data error (cable short circuit) (data low all the time)

Check the pin 6 in P3 on the MCB that it is not shorted to the chassis. Try with another IMUX. This line is short circuit proof and cannot be harmed even if shorted to ground.

E 32.4 IMUX communication error (checksum or parity) (1 sec timeout)

The communication between the MCB and IMUX seems to work most of the time, but there can be an intermittent contact problem in the IMUX cable. Check the connectors and the pins.

E 32.5 Wrong IMUX type or wrong unit type, see service mode 100 and 103.

E 33.n IMUX output short circuit

All valve outputs on the IMUX are short-circuit protected and can withstand short circuits. Additionally, the IMUX CPU is able to read the level on the output pins. Therefore the following detailed information can be presented about possible short circuits.

E 33.1 Syringe select valve (lifetimes) short circuit
E 33.2 Instrument 1 select valve short circuit
E 33.3 Instrument 2 select valve short circuit
E 33.4 Instrument 3 select valve short circuit
E 33.5 Instrument 4 select valve short circuit
E 33.6 reserved
E 33.7 Drive/Cooling air valve short circuit
E 33.8 Air coolant valve short circuit
E 33.9 Water coolant valve short circuit

These errors can only be detected when the circuit is active.

Disconnect the valve indicated and check if the error disappears. Otherwise the problem must be in the valve or its cable, or as the last possibility, on the IMUX. If the error does not disappear even if the valve connector is disconnected, then the IMUX must be replaced.

E 34.n IMUX output open circuit

The following list indicates which output is causing the trouble;

E 34.1 Syringe select valve open circuit
E 34.2 Instrument 1 select valve open circuit
E 34.3 Instrument 2 select valve open circuit
E 34.4 Instrument 3 select valve open circuit
E 34.5 Instrument 4 select valve open circuit
E 34.6 reserved
E 34.7 Drive/Cooling air valve open circuit
E 34.8 Air coolant valve circuit
E 34.9 Water coolant valve circuit

These errors can be detected when the circuit is dead.

Disconnect connector of the indicated bad valve (load) from the IMUX. Measure with an ohmmeter that the valve coil resistance is in the range 50-300Ω. Check the crimping on the connector pins for a bad contact.

E 35.n IMUX pressure sensor offset error (too low output)

Check that the indicated pressure sensor pins are properly inserted in the mating sockets on the PSB. Since the pins are fragile, check also that they are not bent or broken. Check the condition of the ribbon cable between the IMUX and PSB. Check that it is not pinched between the IMUX and the console aluminium bottom. Check with another “known to be good” PSB with sensors attached. Replace the IMUX if the error still is there. Check that the orientation (only if you have disassembled the sensor block) of the sensor s is OK. The sensor amplifier outputs can easily be measured at the respective test points on the IMUX.

E 35.1 Drive/Cooling air pressure sensor output <0.2V
E 35.2 Air coolant pressure sensor output <0.2V
E 35.3 Water coolant pressure sensor output <0.2V
E 35.4 Differential pressure sensor output <0.2V

E 36.n Pressure sensor error

Perform the same check as above.

E 36.1 Drive/Cooling air pressure sensor output >5V
E 36.2 Air coolant pressure sensor output >5V
E 36.3 Water coolant pressure sensor output >5V
E 36.4 Differential pressure sensor output >5V

E 37 Pressure sensor cable not properly attached to the IMUX

Cable is probably loose or not attached to the IMUX ribbon cable connector properly (all sensor signals simultaneously out of bounds). Check also that the PSB is mounted properly so all pressure sensor pins (4 x 4) mates with respective sockets. Check that the ribbon cable is properly manufactured (connectors the right way around - pin 1 to pin 1). Check with a known good PSB and replace the IMUX if necessary.

E 38 reserved

E 39 Drive (cooling) air valve control servo cannot maintain pressure to instrument

The proportional valve gets full power but still the measured pressure does not reach the required level. The most probable reason is that there is something reducing the air flow so that the pressure cannot reach the level required even if the control valve is fully open. Check for air tube kinks inside the unit and console arm. Check the condition of the incoming air pressure regulator and also the air filter. Check that the incoming air pressure is within recommendations. The control valve in the IMUX could also cause this problem. Replace the valve as a last remedy.

E 40, 41 reserved

E 42 Air coolant (spray air) control servo cannot maintain required pressure

The proportional valve gets full power but still the pressure measured does not reach the required level. The most probable reason is that there is something reducing the air flow so that the pressure cannot reach the level required even if the control valve is fully open. Check for air tube kinks inside the unit and console arm. Check the condition of the incoming air pressure regulator and also the air filter. Check that the incoming air pressure is within recommendations. The control valve in the IMUX could also cause this problem. Replace the valve as a last remedy.

E 43, 44 reserved

E 45 Water coolant (spray water) control servo cannot maintain required pressure

The proportional valve gets full power but still the measured pressure does not reach the required level. The most probable reason is that there is something reducing the water flow so that the pressure cannot reach the level required even if the control valve is fully open. Check for water tube kinks inside the unit and console arm. Check the condition of the incoming water pressure regulator and also the water filter. Check that the incoming water pressure is within recommendations. The control valve in the IMUX could also cause this problem. Replace the valve as a last remedy.

E 46 reserved

3.6 Suction tube holder (STH) related error messages

E 47.n Suction holder in branch n is of new type

The recently attached suction hose holder is of a new type and it is not recognized by the control system. Please update the MCB software. The new software is still compatible with the older type suction hose holders as well.

E 47.1 Suction holder in branch 1 is of new type
E 47.2 Suction holder in branch 2 is of new type

E 48.n Number of attached suction tube holders is wrong

If the information given to the unit in the service mode is in conflict with the detected number of suction tube holders then this error is generated.

E 48.1 No suction holders detected
E 48.2 reserved
E 48.3 reserved
E 48.4 reserved

The unit is aware of a built in separator but cannot find a functioning suction tube holder. Either the holder is missing, faulty or the cable to the holder is loose or faulty.

E 49.n Suction Holder cable fault in branch n

Either the holder is missing, faulty or the cable to the holder is loose or faulty. The problem can be intermittent.

E 49.1 Suction holder PCB or its cable is faulty in branch 1
E 49.2 Suction holder PCB or its cable is faulty in branch 2

E 50 reserved

3.7 Foot control related error messages

E 51.n Cable from foot control is loose or connected into wrong connector on MCB

E 51.1 reserved
E 51.2 Foot control is not responding

The foot control cable is disconnected from the unit, or the cable is open circuited, or the foot control has failed. Check if the foot control gets power by checking its that its internal yellow status-LED is blinking. Try to recalibrate the foot control, see page 2.6 “Calibrating foot control” on page H-15 for details.

E 52 Foot control is of new type, update MAIN software

The recently attached foot control is of a new type, of its software is not compatible with the MCB software. Please update the MCB software. The new software on the MCB is also still compatible with the older version(s) of the Prostyle

Compact foot controls.

E 53 Foot control data error (cable short circuit)

The data signal is short circuited to ground. Check the condition of the foot control cable and replace it if necessary. Try with another foot control to determine the location of the problem. Check also the condition of the internal foot control cable going from the MCB to the foot connector at the rear of the unit base.

E 54.n Foot control calibration error

These errors inform that the foot control calibration failed for some reason. The decimal part number gives the details:

E 54.1 Foot control EEPROM write failure
E 54.2 Foot control EEPROM read failure
E 54.3 Pedal too far from the sensors, channel A
E 54.4 Pedal too far from the sensors, channel B
E 54.5 Sensor plate is too much tilted to either side, checksum error
E 54.6 Sensor plate is too close to the PCB, channel A
E 54.7 Sensor plate is too close to the PCB, channel B
E 54.8 Foot control re-trigger error.
Calibrate the foot control. If it does not help, check that the capacitance sector plate on the pedal is not touching the foot control PCB, or is not too close to the PCB. It is also possible, however very unlikely, that the foot control PCB is defect.

E 55 reserved

3.8 Operating light related error messages

E 56 OP-light erroneously connected or short circuit in push-button

This error can occur only during selftest at power up. If the momentary push button is shorted during the test then this error is generated. The button could be damaged, or the reason can be a wrong connection so that the bulb and button are cross-connected. The electronics refuses to turn on the output power to the operating light, until the short has been removed (or the connection has been corrected). This feature protects the OP-light push button from destruction. Obviously the button should not be pressed simultaneously when powering on the unit, to avoid a false error.

E 57, 58 reserved

3.9 Separator system related

E 59.n The separator is reporting an functional error

The separator is signalling the error output (either Metasys (59.1) or Dürr (59.2)). Please check the separator documentation for the meaning for this error signal.

E 60 The separator is not responding or the separator cable is faulty

The stand-by signal is missing from the separator (valid only for Dürr or Metasys). Either the separator is faulty, or the cable between the MCB and separator is faulty. Check that the separator is reaching a power supply voltage. Check that the separator cable is plugged in to the MCB properly.

E 61 Separator is flooded with too much water

This error can occur only if the unit is equipped with a Microvac separator. The error is generated if the water level inside the Microvac rises too high. The reason can be a too fast water flow to the separator compared with the handling capacity of the drain. Check the drain, clean the bottom cup under the Microvac. If necessary, replace the Microvac separator.

E 62 The separator is unknown

The newly attached separator is of a new type and cannot be controlled by the MCB. Please update the MCB software. Check that the separator connector is properly connected and none of the wires are loose.

E 63 reserved

3.10 Patient Chair related

E 64 Seat position potentiometer or its cable is faulty or disconnected

This error occurs if the output signal from the position potentiometer wiper is close to 0V. This indicates that the cable is disconnected or the wiper or the hot end of the pot is open-circuited (cable or pot fault).

E 65 Lift motor does not run or no signal from the position sensing potentiometer

There can be several reasons for this error, but they can easily be divided into 3 categories to be more easily understood;

a) If the motor runs and the chair's lift mechanism moves:
The error must be in the pot, its cable or on the MCB. Check visually the condition of the pot. If the pot's axle is rotating together with the worm screw then check the cable from the pot all the way to the MCB. Turn off the power and use and ohmmeter to do the checking. If the pot and its cable seems to be ok you can additionally check the reading from the pot with the help of the service mode 76 that shows the pot signal on the unit display. Connect an external pot directly to the MCB and use the service mode to check that the MCB is OK.

b) The motor does not run but there is a faint humming sound from the motor.
Check that the movement has not reached either of the mechanical limits. Is the seat overloaded (>150 kg load)? Is there any other mechanical obstruction? Check that the motor capacitor is properly connected and that the capacitor is OK. Check that the motor cable is OK (you should be able to measure the resistance of both windings at the connector that connects to the MCB).

c) The motor is completely dead.
Is the motor very hot? It is possible to overheat the motor if you run it continuously for more than about 2 minutes, or if the motor runs more that 13% of the time. When the motor heats up the built in over-temperature switch disconnects the common wire, resulting in a temporarily dead motor. When the motor cools down (this can take 10...20 min.) it returns back to normal operation. Check also the connector and cables to the motor if it is not overheated but still dead.

E 66 Lift motor or its position pot cable has a wrong connection

This error can occur only if you install a new motor or pot and either of these have a cable with crossed conductors. In other words, the pot signal (or motor running direction) is opposite to what it should be. Check that the cable(s) are according to the drawings.

This error could occur also if the motor direction relay on the MCB has failed. Check that the direction re-lay is toggling when trying to alternatively drive the mechanism in both directions.

E 67 Backrest position potentiometer or its cable is faulty or disconnected

Please refer to the explanation for the lift motor (ER64), since both motor drives are equal.

E 68 Backrest motor does not run or no signal from the position sensing potentiometer

Please refer to the explanation for the lift motor (ER65), since both motor systems are equal.

E 69 Backrest motor or its position pot cable has a wrong connection

Please refer to the explanation for the lift motor (ER66), since both motor systems are equal.

E 70, 71 reserved

3.11 MAIN CPU related error messages

E 72.n Software chip (Flash-EPROM) error

In either case it is highly recommended to immediately replace the Flash-EPROM in the socket IC2 on the MCB.

E 72.1 Program (Flash-EPROM) error. Main software is corrupted. Replace Flash- EPROM.
E 72.2 Program (Flash-EPROM) error. Boot software is corrupted. Replace Flash- EPROM.

E 73.n EEPROM problems

In most cases the CPU chip in socket IC3 should be immediately replaced.

E 73.1 EEPROM error, CPU EEPROM erase/program failure, replace CPU
E 73.2 CPU configuration register contents are wrong, replace CPU
E 73.3 CPU EEPROM checksum error
E 73.4 CPU EEPROM checksum programmed. Replace CPU if error occurs often.

E 74.n RAM problem

If these errors appear repeatedly, please replace the whole MCB.

E 74.1 RAM error, External RAM test failure, replace RAM
E 74.2 CPU RAM test failure, replace CPU

E 75.n Program structure error

These errors do not necessarily indicate a hardware error.

E 75.1 CPU error, Watchdog reset
E 75.2 Illegal OP-code
E 75.3 Illegal vector
E 75.6 Mains voltage failure
E 75.7 Clock monitor reset

E 76 reserved

E 77 Error in communicating with external device

reserved for future use

Chapter

E

PREVENTIVE MAINTENANCE

NOTE ***The preventive maintenance should be performed once a year by a qualified service technician.***

1 DELIVERY ARMS

OP delivery arm

- Arm friction. Adjust if needed, refer to section 1.2 “Adjusting friction of the OP delivery arm joints” on page F-2.
- Arm balance. Adjust if needed, refer to section 1.3 “Adjusting balance of the OP delivery arm” on page F-3.

Side delivery arm

- Arm frictions. Adjust if needed, refer to sections 1.5 “Adjusting the side delivery arm base joint friction” on page F-10, 1.6 “Adjusting the friction of the side delivery arm joint” on page F-10, 1.7 “Adjusting the side delivery arm instrument console friction” on page F-11 and 1.8 “Adjusting the lifting friction of the side delivery arm” on page F-11.

2 SUCTION ARMS

Ergo suction arm

- Arm friction. Adjust if needed, refer to section 1.10 “Adjusting friction of the ergo suction arm” on page F-15.

Adjustable suction arm

- Arm friction. Adjust if needed, refer to section 1.11 “Adjusting friction of the adjustable suction arm” on page F-15.

3 INSTRUMENT CONSOLE

Oil collector

- Clean the collector.

Instrument arms

- Condition of the arms. Replace if needed.

Instrument hoses

- Condition of hoses. Replace if needed.
- Condition of quick connectors.
- Condition of rubber gasket. Replace if needed.
- Check for leaks.

Control panel

- All the keys are working.

4 INSTRUMENTS

Syringe

- Tip is clean.

Turbine

- Drive air pressure. Service mode 30.
- Bulb voltage.
- O-rings. Change automatically twice a year.
- Lubricate.

Micromotor

- Bulb voltage.
- O-rings. Change automatically twice a year.
- Lubricate.

Polymerization light

- Bulb voltage. Recommended voltages are 8.90 Vdc (Lysta), 15.4 Vdc (Satelec), 10.0 Vdc (Demetron, PowerLysta).

5 FOOT CONTROL

Pedal

- Operation check. If the pedal does not move smoothly, remove the cover and clean and oil the pedal joint and all the surfaces which the pedal touches.

Chair control

- Operation check.

6 CUSPIDOR

Water regulator

- Change the filter.
- Change the membrane.
- Change and lubricate the plug.
- Check for leaks.

Air regulator

- Change the filter.
- Change the membrane.

Fuses

- Condition check

Bowl

- Bowl filter condition. Replace if needed.
- Glass filling/bowl rinsing is working.
- Check the operation of the bowl microswitch.

Internal air and water pressures

- Check the pressures in service mode 38. Adjust if needed, refer to 3.1 “Adjusting internal water & air pressures” on page F-23.

Lift motor

- Operation check.
- Clean and grease the worm screw. If there is any rust on the worm screw or nut, or if they are worn, replace them. Additionally, if you find any rust or damage, check for signs of leaks and eliminate the cause of the leaks.

7 CHAIR

Backrest motor

- Operation check.
- Clean and grease the worm screw.

Emergency switches

- Operation check.

Upholsteries

- Condition check.
- Upholsteries are firmly in place. The screws of the seat upholstery are tightened.

8 SUCTION SYSTEM

Suction tubes

- Open and clean the suction nozzles.
- Tube condition check.

Coarse filter

- Condition check. Replace if needed.

Amalgam collector

- Condition check. Replace if needed.

Microvac II suction system

- Change the middle bottom membrane.
- Change the bottom drain membrane.
- Change the pressure balancing membrane.
- Check the rubber sealing.

Other suction systems

- Refer to the manufacturer’s instructions.

9 OPERATING LIGHT

- Clean the protective fascia.
- Operating light is in focus.
- Light is not turning with the arm.
- Check the voltage.

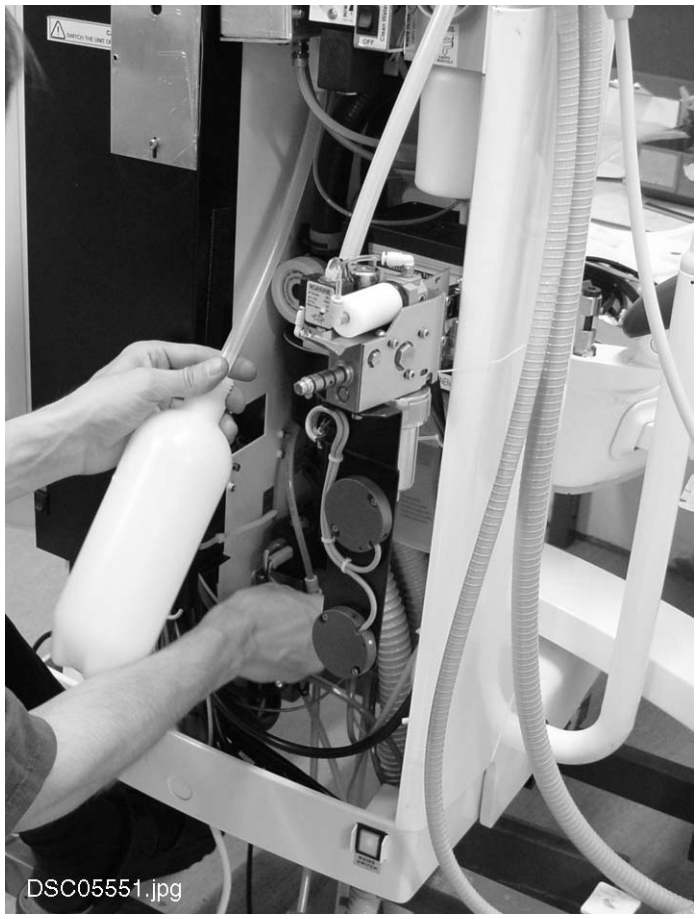
10 CLEAN WATER SYSTEM

- Operation check.

11 WATER MANAGEMENT SYSTEM (WMS)

Checking / adjusting the water flow

- Open the cuspidor door and switch on the pump (bottle switch in ON position). Close the door.
- Enter the service mode 127.
- Enter the SET-mode by pressing and holding the “S”-key until the yellow indicator light turns on.
- Run water from the glass fill tube until the separation tank is empty (you will hear when the tank is empty). Note, that the water will not flow if you do not have glass in the holder.
- Open the cuspidor door. Detach the pump water tube from the container quick connector and place it into the **empty** container as shown on the figure below.



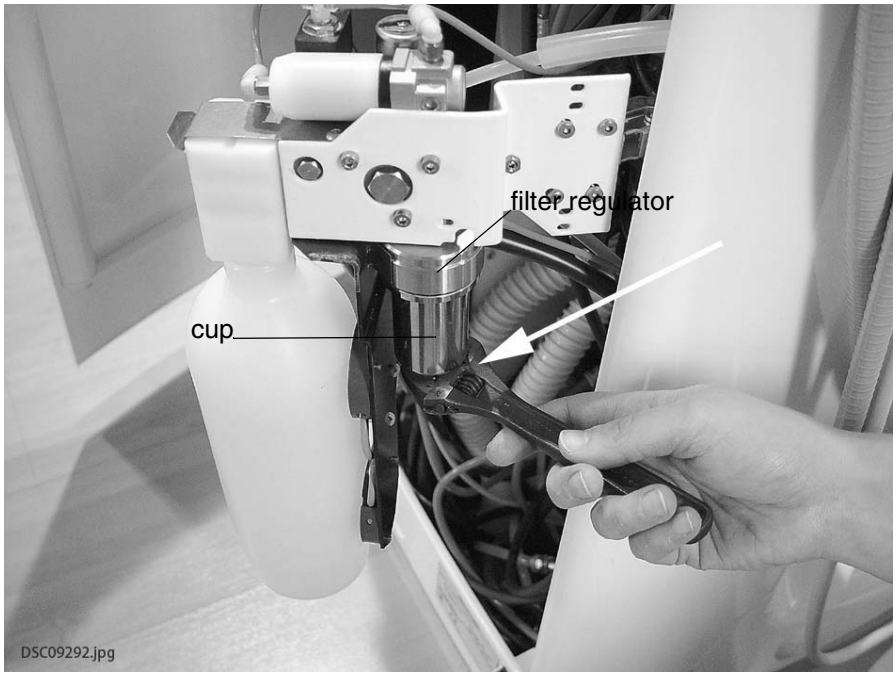
- The water will flow for one minute when you press the B-key briefly. The water flow can be stopped by pressing the A-key, if needed.
- Press the B-key briefly and let the water run for one minute. Pour the water into a glass measure or measure the water level on the container: 100 mm water level is equivalent to 330 ml, 120 mm = 400 ml and 140 mm = 500 ml.
- The water flow must be:
  Metasys typ1 and Compact, Microvac, no suction: 330 - 400 ml / min.
  Dürr and Dürr VSA systems: 400 - 500 ml /min.

- The water flow adjustment knob is located on the magnetic valve/pressure regulator assembly (arrow on the figure below). Loosen the adjustment knob locking screw: hold the knob in position and turn the locking screw. Adjust the flow by turning the adjustment knob.

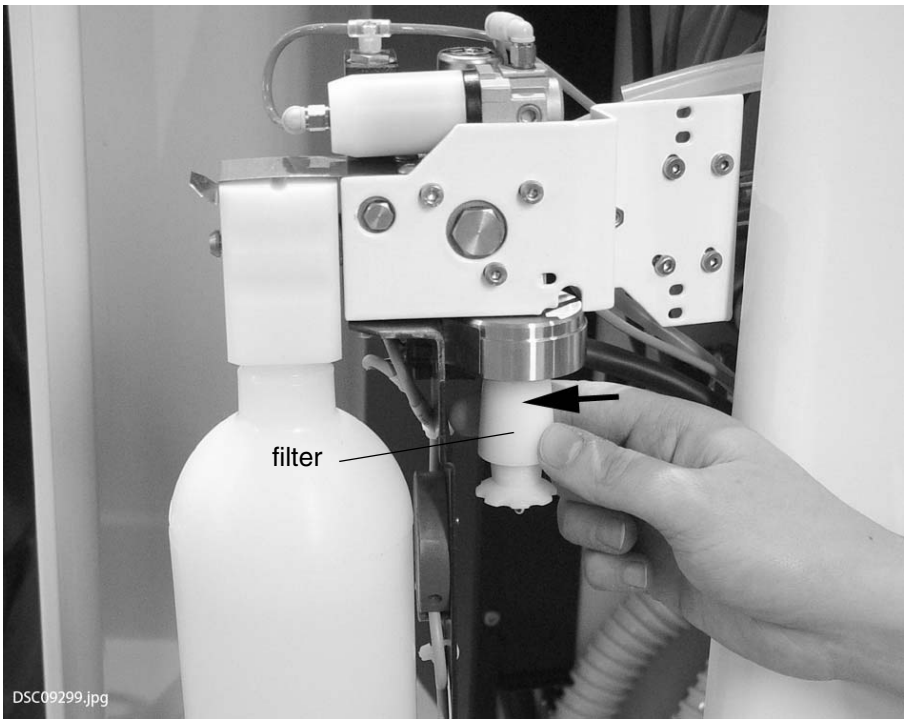
- When the water flow is correct, lock the adjustment knob with the locking screw: hold the knob in position and turn the lock ring. Attach the pump water tube to the container quick connector.

11.1 Changing the water filter (00271003)

- Switch off the dental unit.
- Open the cuspidor door.
- Unscrew clockwise the cup of the filter regulator with a 17 mm fork spanner.



- Unscrew clockwise the filter from its position.



- Remove the spring from the old filter and place it inside the new filter.
- Attach the new filter to its position.
- Attach the cup back to its position.
- Close the cuspidor door.

Chapter

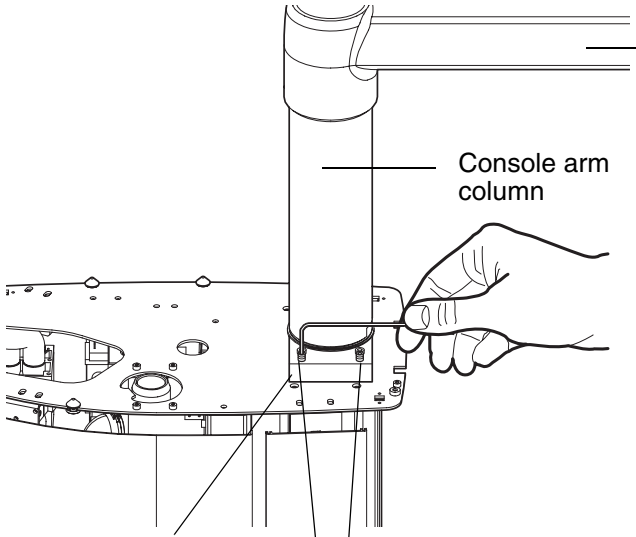
F

ADJUSTMENTS

1 MECHANICAL ADJUSTMENTS

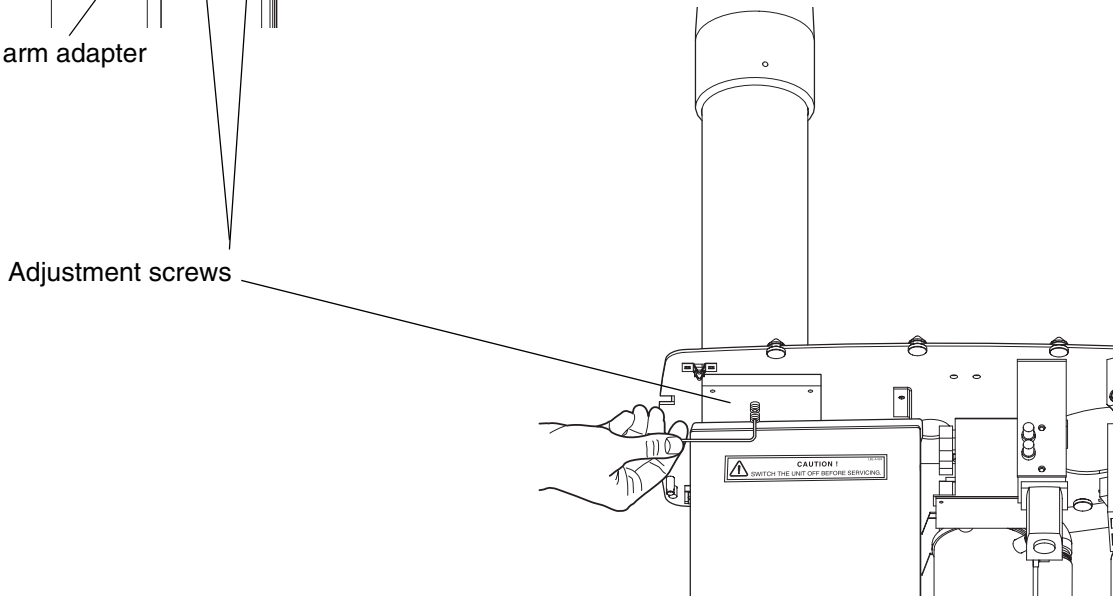
1.1 Adjusting vertical position of the OP delivery arm column

The console arm column must be vertical. You may have to adjust its position, if the floor is very inclined.

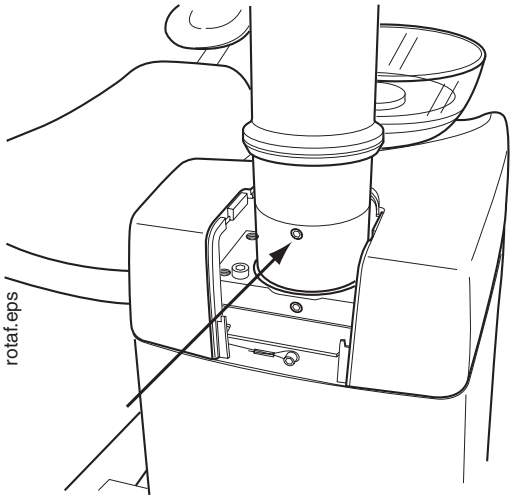


To adjust the vertical position of the console arm column:

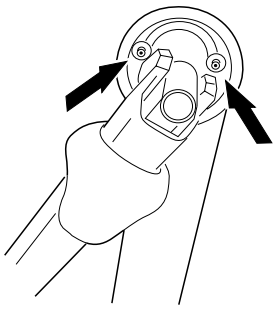
1. Remove the bowl.
2. Remove the cuspidor covers.
3. Adjust the position of the console arm adapter with the three M8x12 DIN 913 adjustment screws supplied with the mounting accessories. Refer to the figures for the location of the three holes.
4. Reassemble in reverse order.



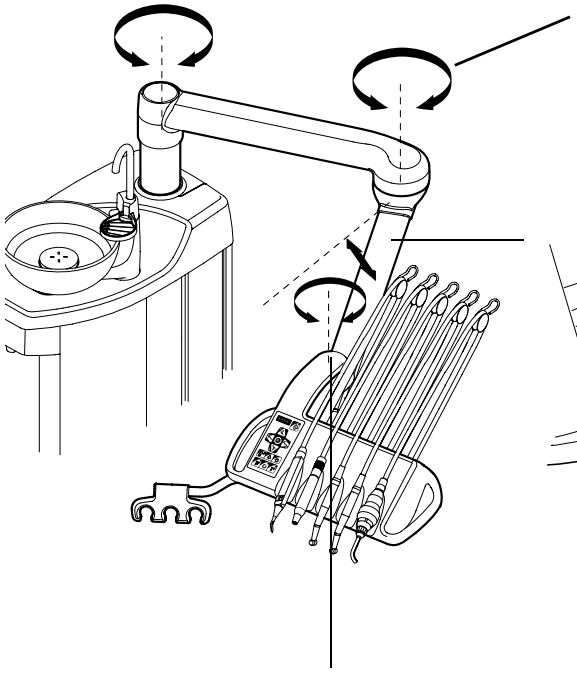
1.2 Adjusting friction of the OP delivery arm joints

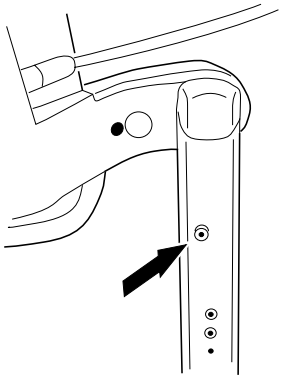


To adjust the rotational friction of the console arm column:
1. Remove the small cover plate from the cuspidor cover.
2. Unscrew the two M5x10 screws and remove the holder plate.
3. Adjust the friction with the adjustment screw located on the console arm column.
4. Reassemble in reverse order.

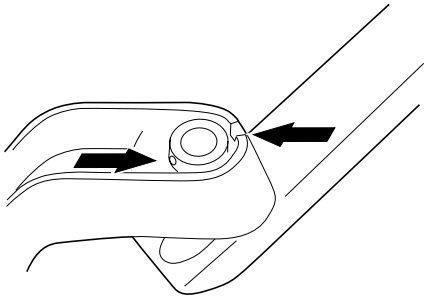


Adjust the rotational friction of the console arm with the 4 mm allen key. Adjust the two screws equally to avoid wearing. Tightening the screws increases the friction.





Adjust the lifting friction of the console arm with the 4 mm allen key. Tightening the screw increases the friction.

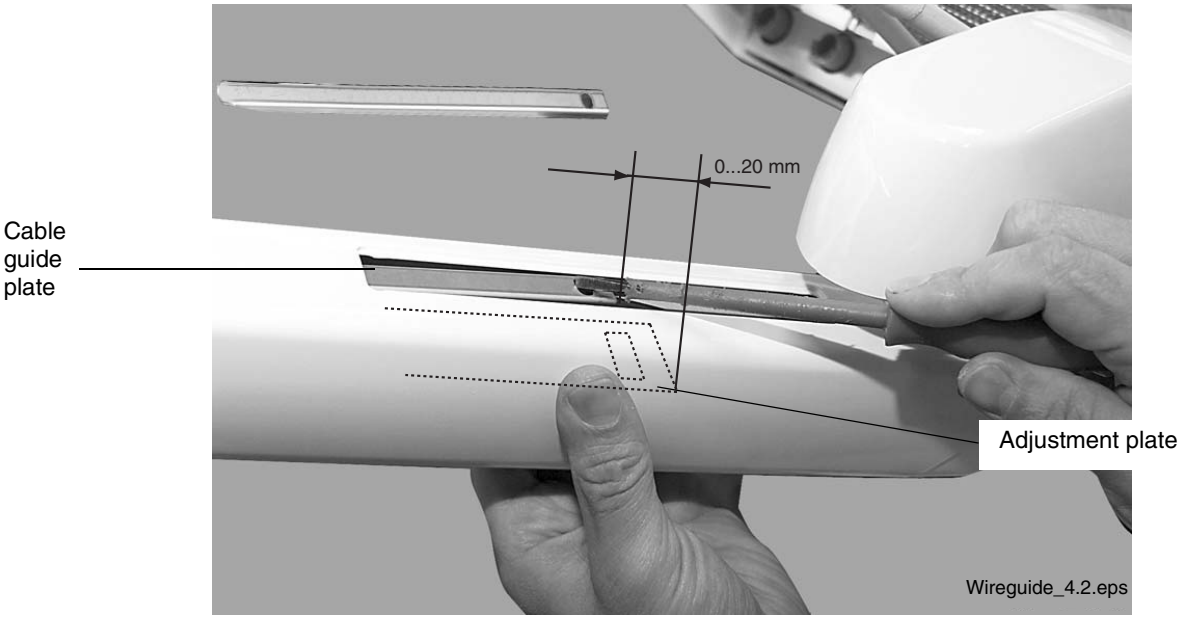


Adjust the rotational friction of the instrument console with the 4 mm allen key. Adjust the two screws equally to avoid wearing. Tightening the screws increases the friction.

1.3 Adjusting balance of the OP delivery arm

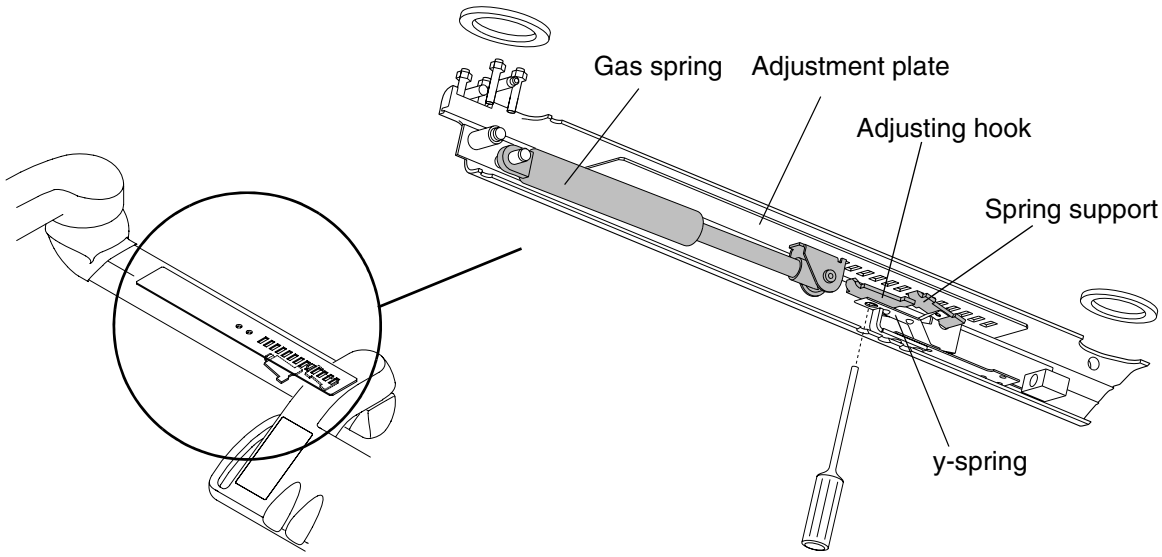
Remove the cable guide plate.

NOTE ***When replacing the cable guide plate to its position, note that the distance between the end of the guide and the end of the adjustment plate must be 0-20mm (0-0.8 in.).***



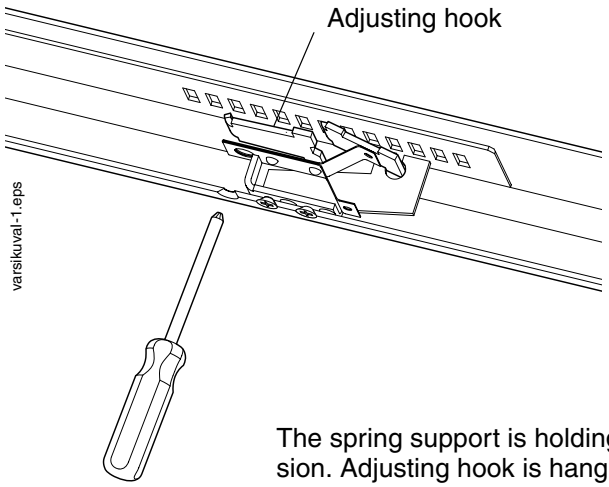
Adjusting the balance

The adjustment plate, which is connected to the gas spring, is held in position with the spring support. To increase or decrease the tension of the gas spring, the position of the spring support compared to the adjustment plate must be altered. This is done with the aid of the adjusting hook, which is pushed by a screwdriver (use a robust, round-shaped (not six-edged) screwdriver with a diameter of 4.5…5.5 mm).



Increasing tension of the gas spring (more load)

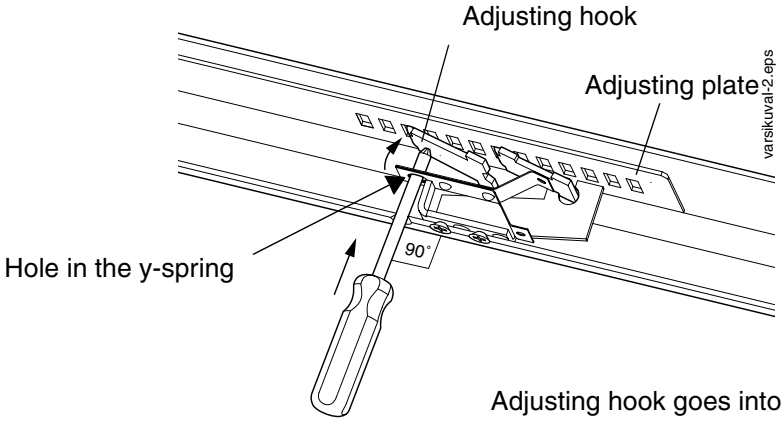
I-1) Lower the console arm to its lowest position.



The spring support is holding the gas spring at the preset tension. Adjusting hook is hanging freely.

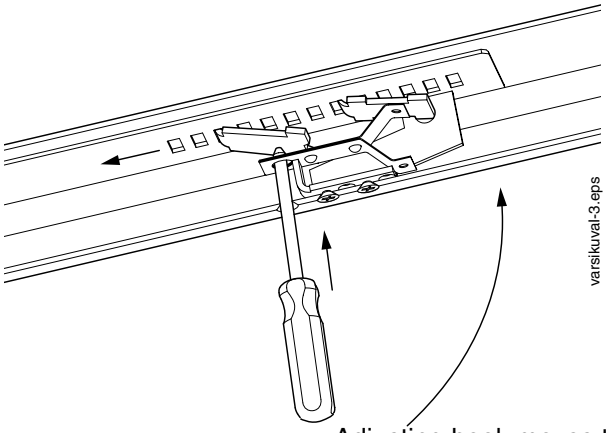
I-2) Insert a screwdriver into the arm (through the opening at the underside of the arm) and push the adjusting hook (inside the arm) into a groove of the adjustment plate. Make sure that the screwdriver goes through the hole in the y-spring. Insert the screwdriver into the arm perpendicularly towards the arm.

NOTE ***Do not let the screwdriver go through the groove on the adjustment plate to avoid damaging the tubes above the adjustment plate.***



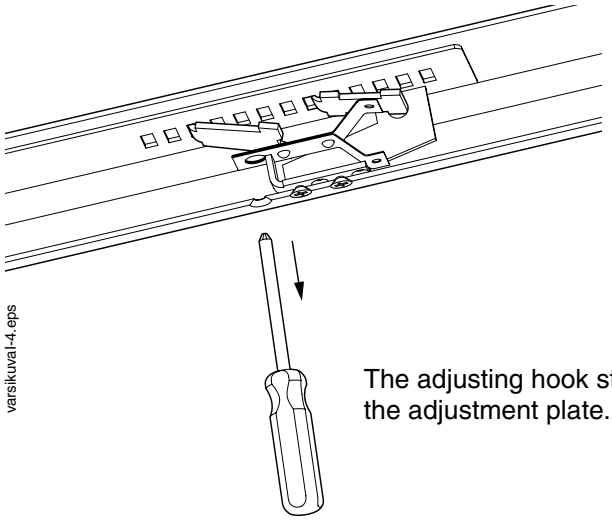
Adjusting hook goes into a groove of the adjustment plate.

I-3) Hold the screwdriver inside the arm and lift the arm to its highest position, while keeping the screwdriver in the same position compared to the arm.



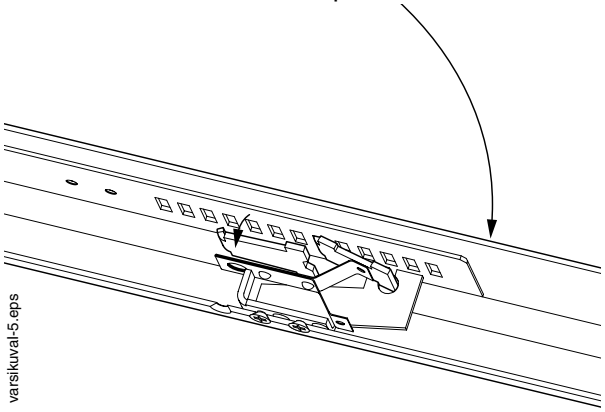
Adjusting hook moves the adjustment plate away from the instrument console and the hook of the spring support moves to the next groove of the adjusting plate.

I-4) Remove the screwdriver from the arm.



The adjusting hook stays in the groove of the adjustment plate.

I-5) Lower and lift the arm a couple of times.

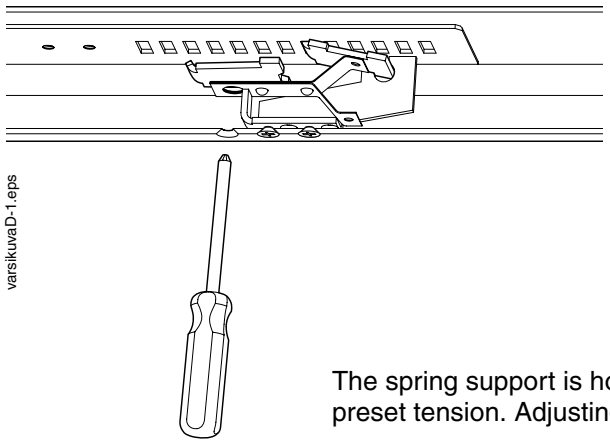


The adjusting hook releases from the groove. The spring inside the adjustment mechanism pushes the spring support into a groove of the adjustment plate. The tension of the gas spring is now increased by one step.

I-6) Repeat the procedure if necessary. There are totally seven steps to increase the tension of the gas spring (from the fully decreased spring).

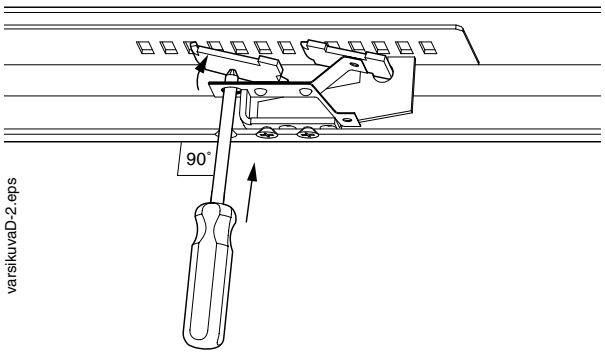
Decreasing tension of the gas spring (less load)

D-1) Move the console arm to horizontal position (or a little below the horizontal plane).



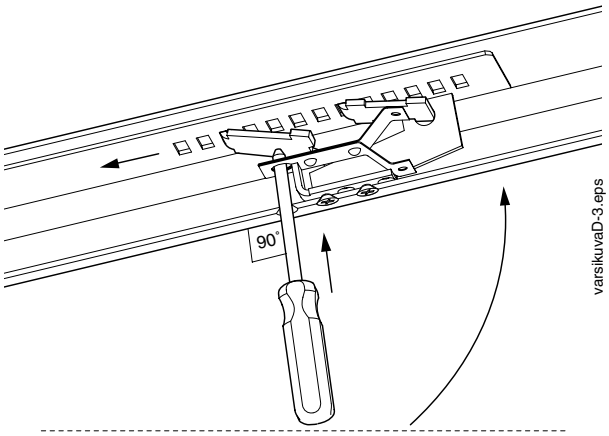
The spring support is holding the gas spring at the preset tension. Adjusting hook is hanging freely.

D-2) Insert a screwdriver into the arm (through the opening at the under side of the arm) and push the adjusting hook (inside the arm) into a groove of the adjustment plate. Make sure that the screwdriver goes through the hole in the y-spring. Insert the screwdriver into the arm at the right angle (90°) compared to the arm.



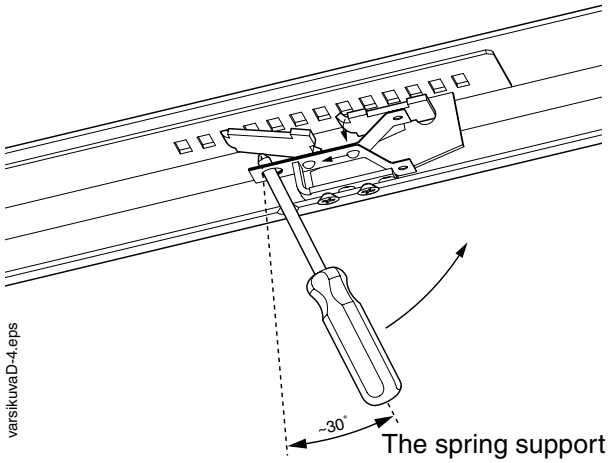
Adjusting hook goes into a groove of the adjustment plate.

D-3) Hold the screwdriver inside the arm in the same position compared to the arm and lift the arm to its highest position.



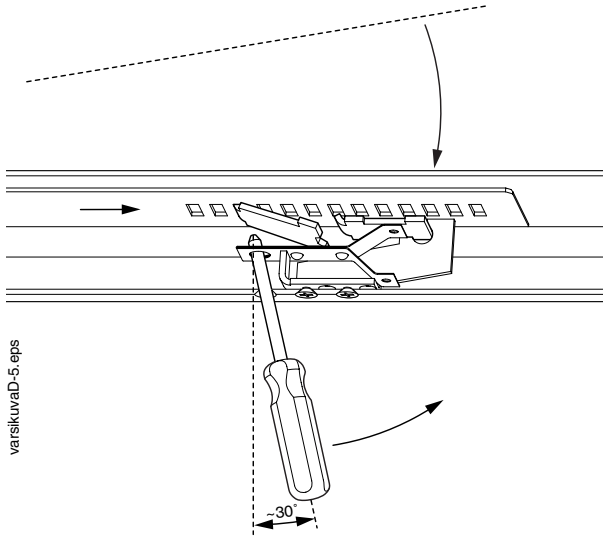
Both the adjusting hook and the spring support stay in the grooves of the adjustment plate.

D-4) Turn the handle of the screwdriver towards the instrument console and hold it in that position. **Do not turn the screwdriver more than 30° to avoid damaging the y-spring.**

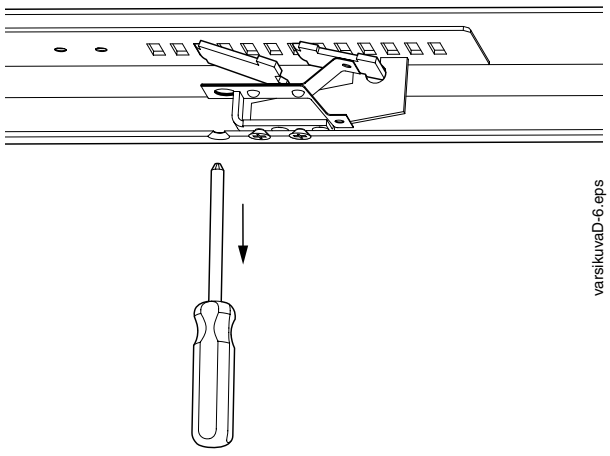


The spring support is released from the groove.

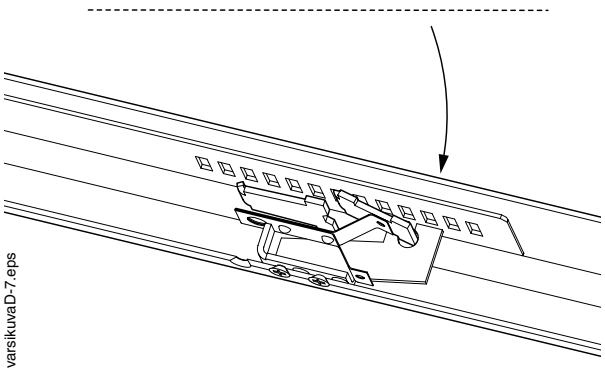
D-5) Lower the arm to horizontal position while holding the screwdriver at the same position compared to the arm.



D-6) Remove the screwdriver from the arm.



D-7) Lower the arm to its lowest position.



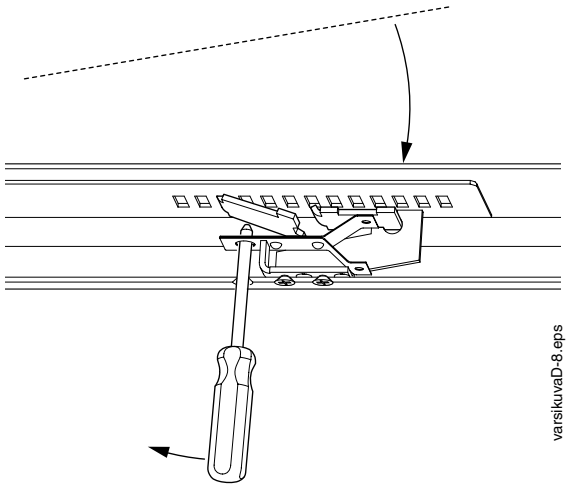
The adjusting hook releases from the groove. The y-spring inside the adjustment mechanism pushes the spring support into a groove of the adjustment plate. The tension of the gas spring is now decreased by one step.

D-8) Repeat the procedure if necessary. There are totally seven steps to decrease the tension of the gas spring (from the fully increased spring).

Problems in adjusting the gas spring:

If the tension of the gas spring can not be adjusted, the y-spring may be damaged. In this case the gas spring can be adjusted as follows:

After step I-3 or D-5 do not remove the screwdriver from the arm, but turn the handle of the screwdriver carefully away from the instrument console (see figure below) while lowering the arm. This will help the hook of the spring support to go into the groove.



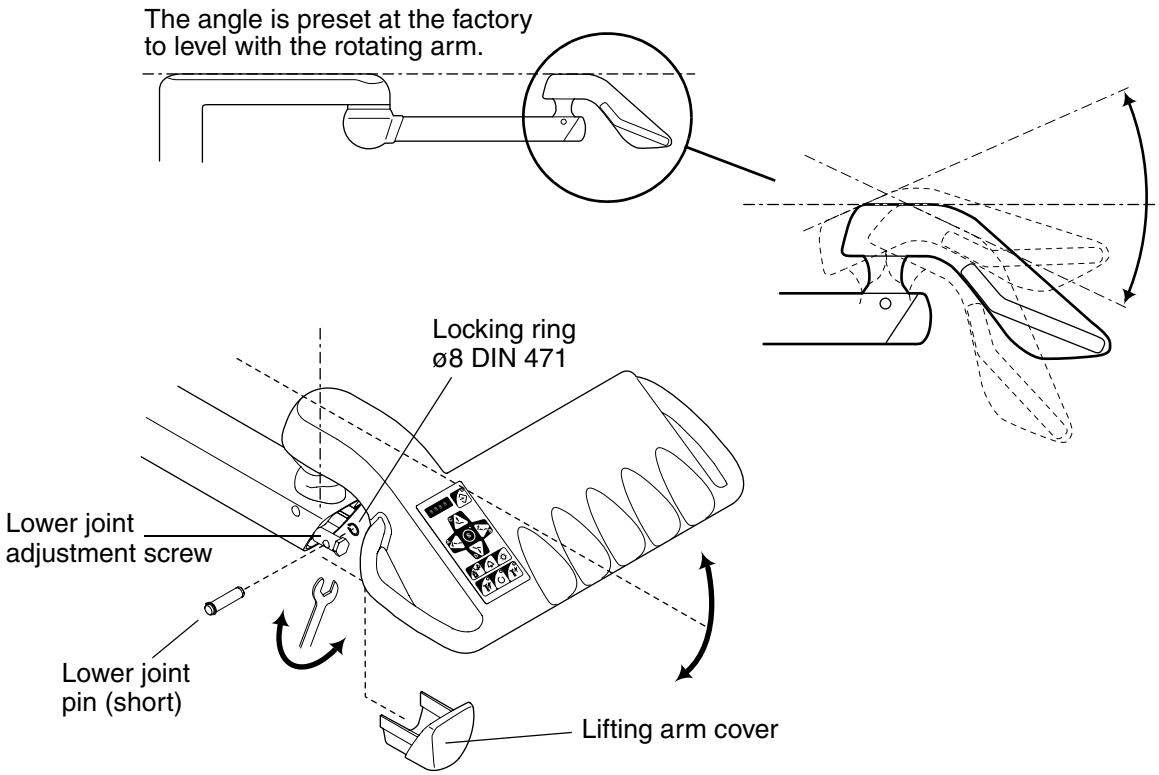
1.4 Adjusting angle of the OP delivery arm instrument console

a) Remove the lifting arm cover.

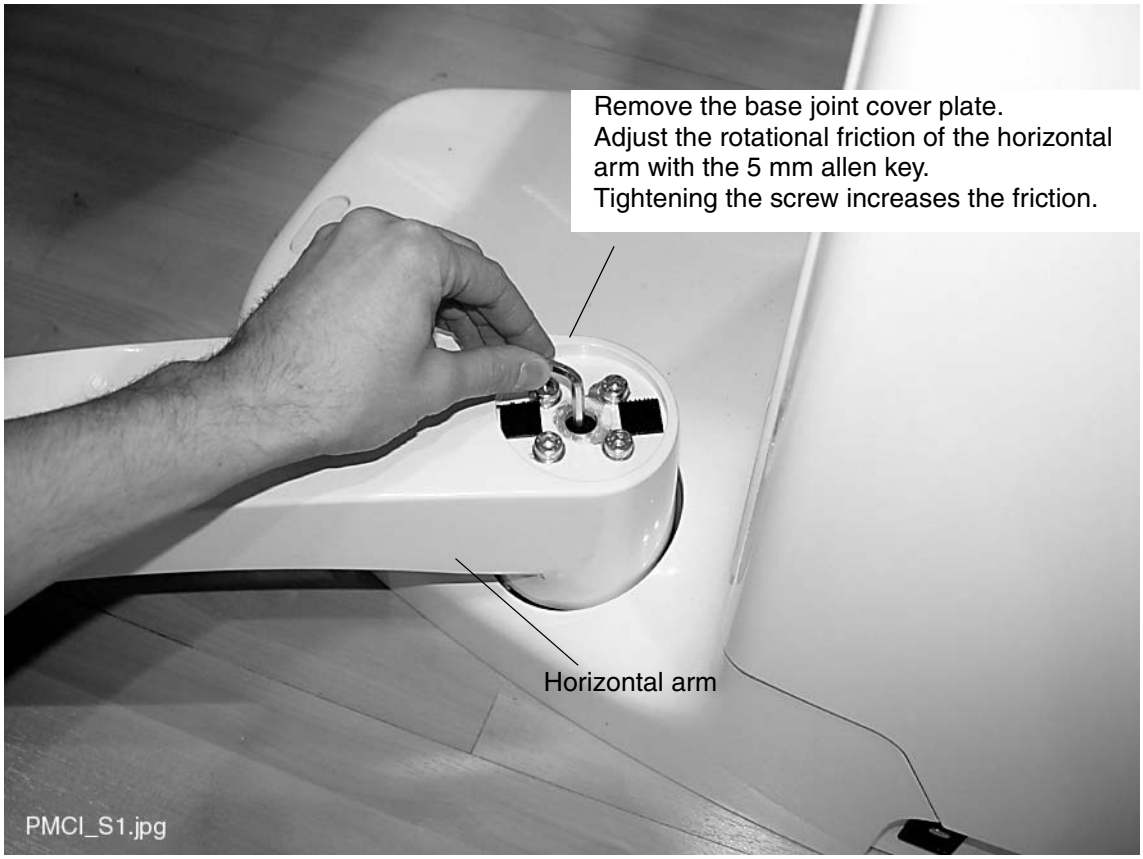
b) Remove the ø8 DIN 471 locking ring and pull out the lower joint pin (short).

c) Adjust the angle of the instrument console by turning the lower joint adjustment screw with a 15mm set wrench. The angle is preset at the factory to level with the rotating arm.

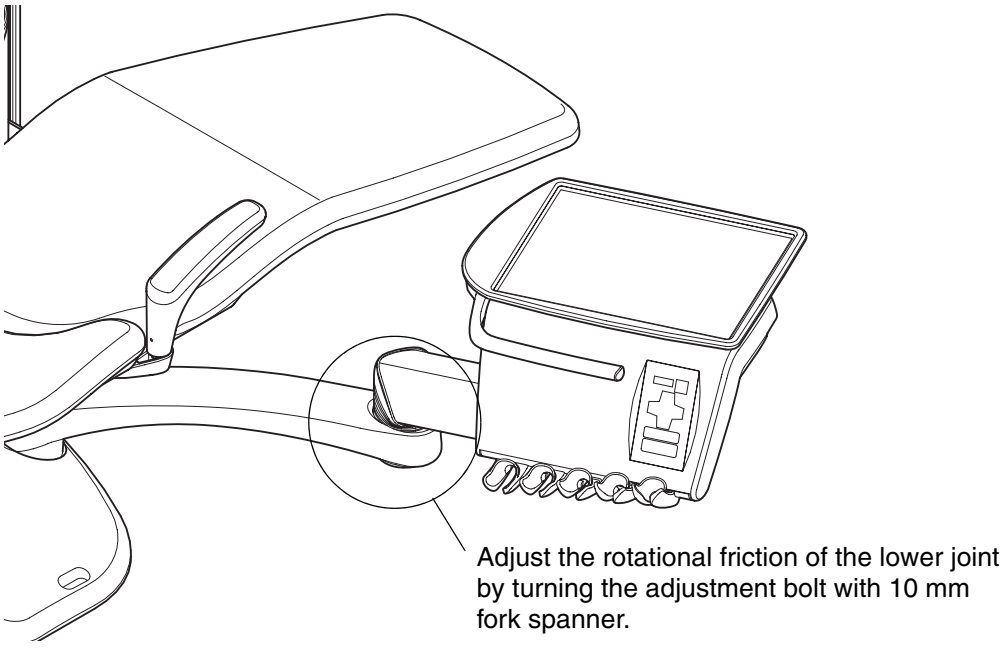
d) Assemble the lower joint in reverse order.



1.5 Adjusting the side delivery arm base joint friction

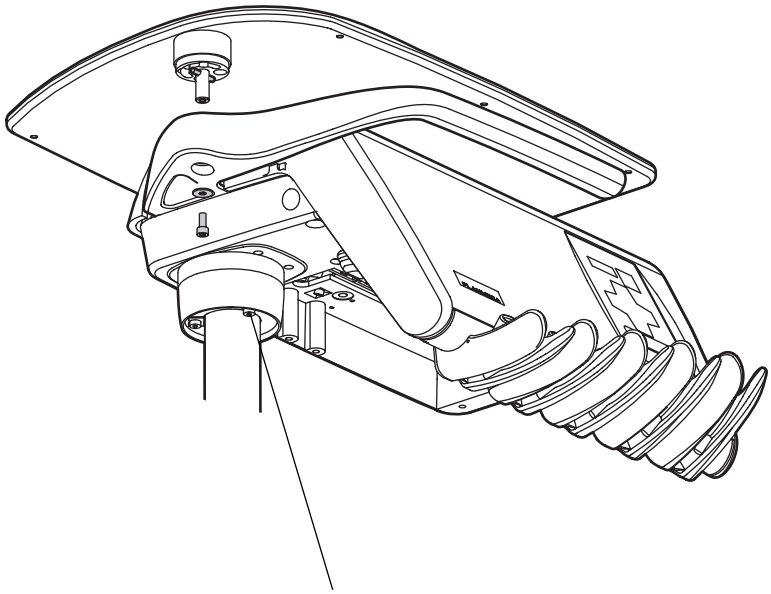

Remove the base joint cover plate.
Adjust the rotational friction of the horizontal arm with the 5 mm allen key.
Tightening the screw increases the friction.
Horizontal arm
PMCI_S1.jpg

1.6 Adjusting the friction of the side delivery arm joint



1.7 Adjusting the side delivery arm instrument console friction

Adjust the rotational friction of the instrument console with the adjustment screw located below the instrument console. There is a black washer below the adjustment screw (attachment screws do not have washers).

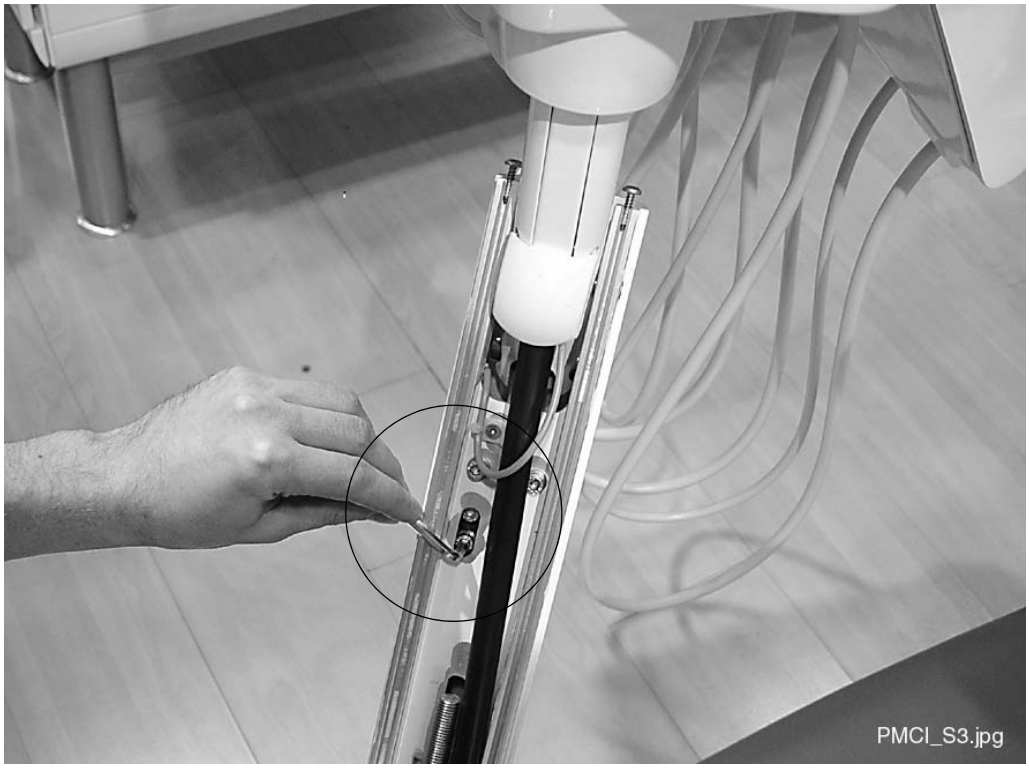


Friction adjustment screw

1.8 Adjusting the lifting friction of the side delivery arm

Remove the level arm cover by first pulling it from its upper end with both hands as shown on the figure below. After detaching the upper end the cover can be lifted away from its position.

Adjust the lifting friction of the delivery arm with the 5 mm allen key. Adjust the two screws of the level arm friction block equally. Tightening the screws increases the friction.

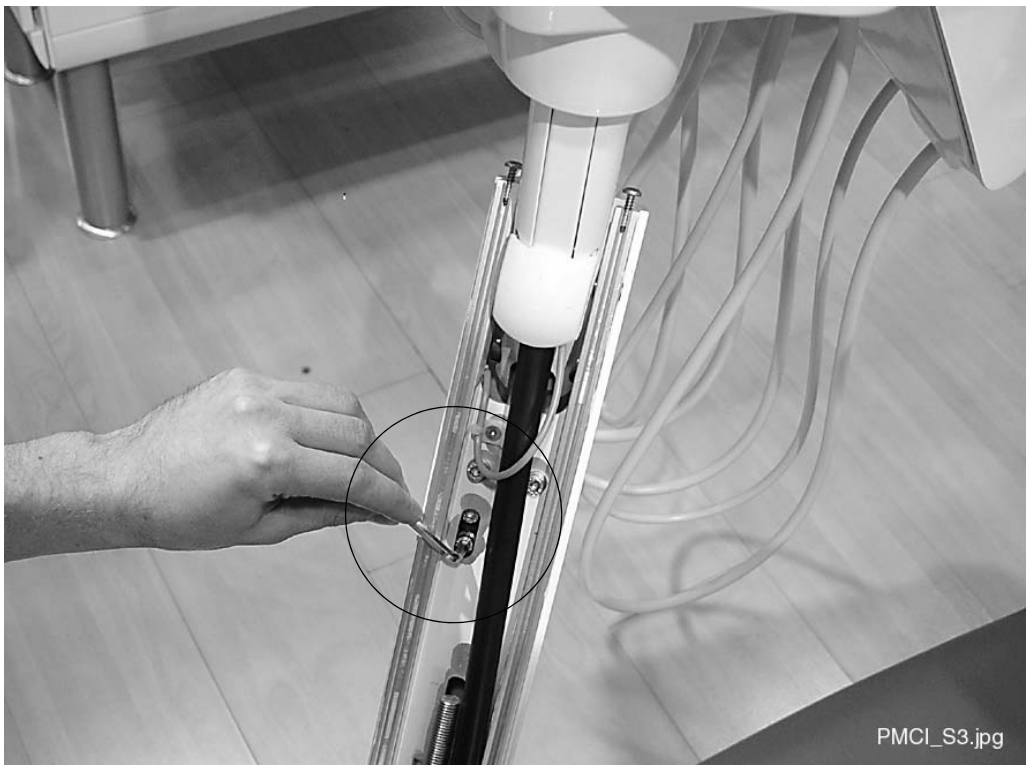


Attach the level arm cover back to its position.

1.9 Adjusting the tension of the side delivery arm gas spring

Remove the level arm cover by first pulling it from its upper end with both hands as shown on the figure below. After detaching the upper end the cover can be lifted away from its position.

Before adjusting the tension of the gas spring decrease the lifting friction of the side delivery arm with the 5 mm allen key. Adjust the two screws of the level arm friction block equally. Loosening the screws decreases the friction.



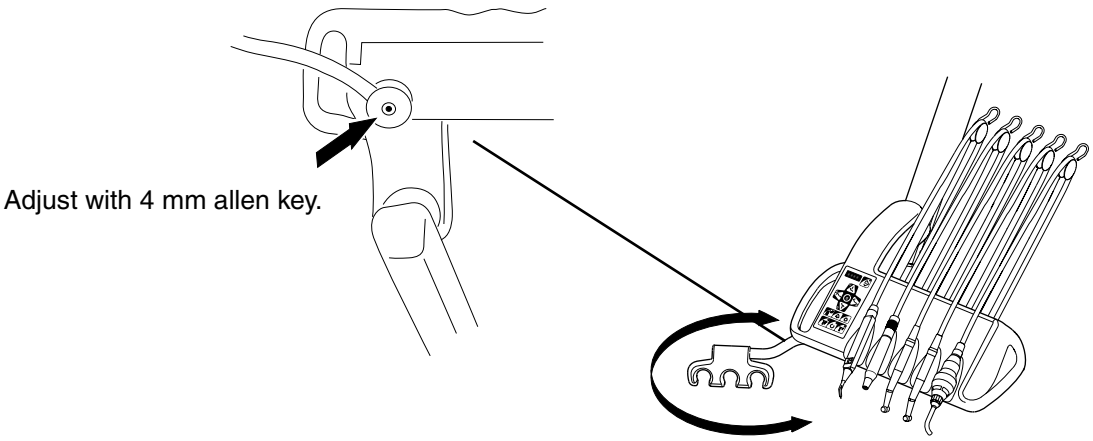
Adjust the tension of the gas spring by rotating the adjustment screw (located in the lower end of the gas spring) with the 6mm Allen key as shown on the figure below. Turning the screw clockwise will increase the tension, i.e, the weight-carrying capacity.

Adjust the lifting friction of the delivery arm with the 5 mm allen key.

Attach the level arm cover back to its position.

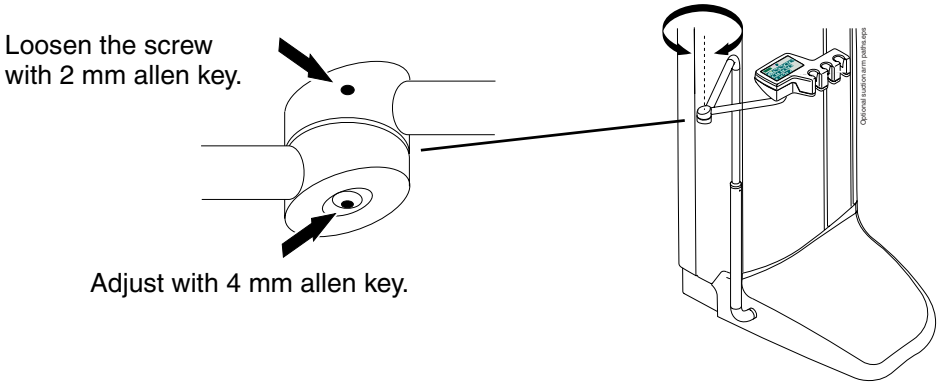
1.10 Adjusting friction of the ergo suction arm

Adjust the rotational friction of the suction arm with the 4 mm allen key. Tightening the screw increases the friction.



1.11 Adjusting friction of the adjustable suction arm

Loosen the holding screw at the side of the optional suction arm joint with the 2 mm allen key. Adjust the rotational friction of the joint with the 4 mm allen key. Tightening the screw increases the friction. Lock the screw into position with the holding screw.



1.12 Removing play of the lifting adapter

CAUTION ***When removing the play of the lifting adapter, tightening the screws that adjust the sliding support and the colliding support is recommended to be done by hand. Over-tightening the screws will increase friction and cause wearing to the sliding support and the colliding support.***

Removing vertical play

a) Loosen the M8 DIN 934 nut that is securing the colliding support in position.

b) Remove the vertical play by tightening the M8x25 DIN 913 screw with a 4mm allen key.

c) Tighten the M8 DIN 934 nut to secure the colliding support into position while holding the screw with the allen key.

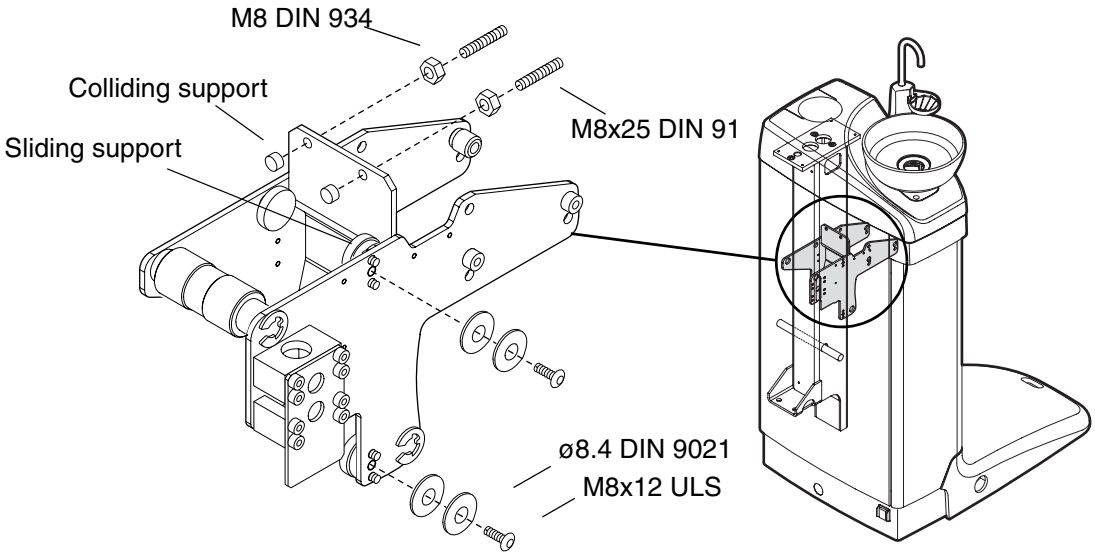
d) Repeat the above for the other colliding support.

Removing sideways play

a) Unscrew the M8x12 ULS screw holding the sliding support in position and remove the two ø8.4 DIN 9021washers.

b) Screw the M8x12 ULS screw and the washers back into position and remove the sideways play by tightening the screw. Use some locking agent to secure the screw into position.

c) Repeat the above for the other sliding support.



1.13 Adjusting the instrument arms

The tube guide/roller assembly can be turned around the axis of the instrument arm. Make sure that the roller is in exact vertical position. The roller is adjusted as follows.

a) Detach the roller by pulling it.

b) Remove the spreading rubber from inside the axle of the roller.

c) Loosen the M3x6 DIN 916 screw inside the axle and twist the tube guide to get the roller in vertical position.

d) Tighten the M3x6 DIN 916 screw and place the spreading rubber back inside the axle.

e) Push the roller back to its position.

The switching operation is adjustable and it should take place when the instrument arm is bent 20°…30°. The switching operation is adjusted as follows.

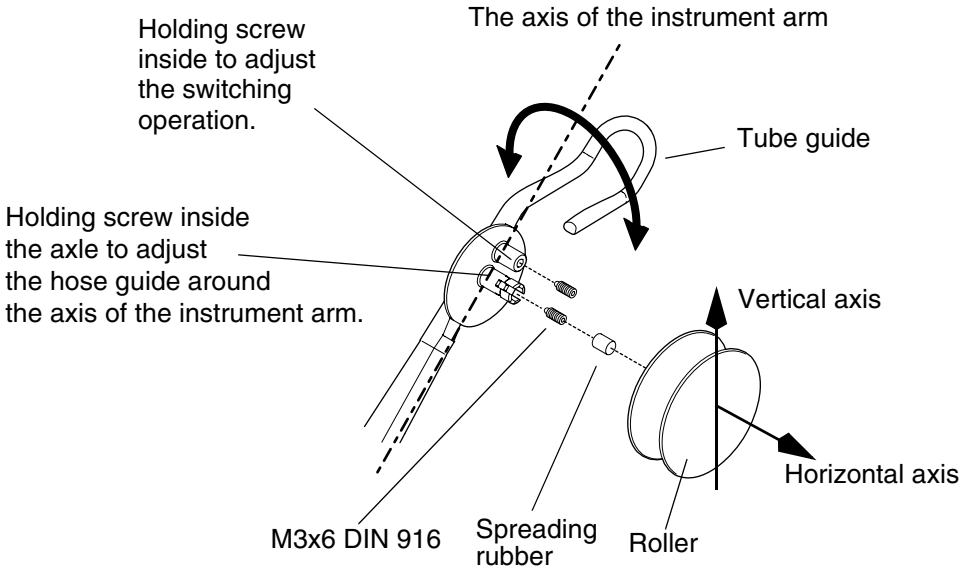
a) Detach the roller by pulling it.

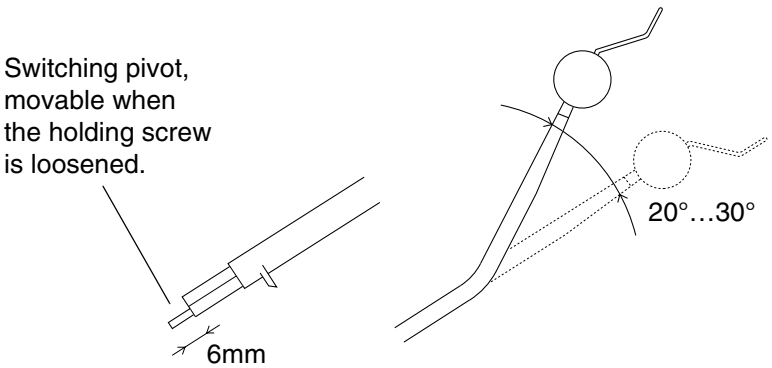
b) Loosen the M3x6 DIN 916 screw. The switching pivot at the lower head of the arm is now movable. The more the switching pivot comes out from inside of the instrument arm the bigger the bending angle of the arm will be before the switch connects.

c) Adjust the switching pivot and tighten the M3x6 DIN 916 screw.

d) Push the roller back to its position.

The switching pivot is adjusted at the factory to come out 6mm from inside the arm at the arm-rest position. In that case the instrument arm bends 20°…30° before the switch connects.


The axis of the instrument arm
Holding screw inside to adjust the switching operation.
Tube guide
Holding screw inside the axle to adjust the hose guide around the axis of the instrument arm.
Vertical axis
Horizontal axis
M3x6 DIN 916
Spreading rubber
Roller



2 ELECTRICAL ADJUSTMENTS

2.1 Calibrating backrest motor position sensor

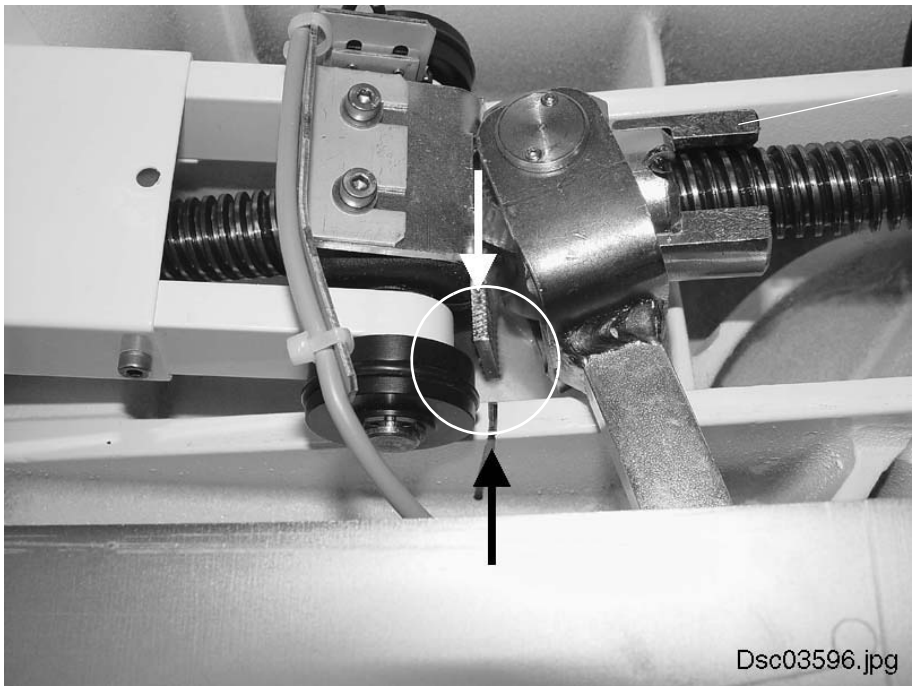
WARNING

During the calibration of the backrest motor position sensor all software limits are ignored. Special care must be taken for not to damage the unit by driving the backrest to its mechanical limits.

a) Enter service mode 80. The display will show letter “b” (for backrest) followed by two horizontal lines.

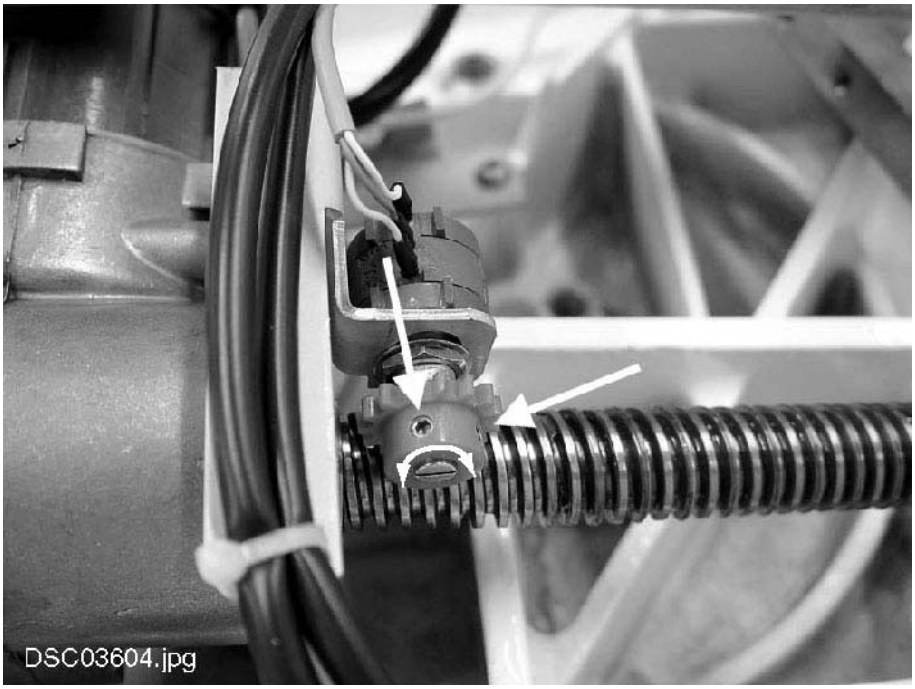
b) Enable backrest motor movements by holding down the spit position key for 10 seconds.

c) Using the A and B keys from the control panel, drive the backrest into position where the calibration mark on the chair casting and the lug of the spindle nut assembly are aligned.



Spindle nut assembly

d) Loosen the two M3x6 DIN 916 screws at the side of the cog wheel of the sensor.



e) Rotate the axle of the sensor with a screwdriver until the two horizontal lines on the display are in line.

The sensor presumes the backrest to be at a too low position.

Rotate the sensor axle counter clockwise (seen from the axle).

The backrest position sensor is calibrated correctly.

The sensor presumes the backrest to be at a too high position.

Rotate the sensor axle clockwise (seen from the axle).

f) Tighten the two M3x6 DIN 916 screws to secure the cog wheel into position.

g) Using the A key drive the backrest downwards and after the lowest position is reached continue pressing the A key for approx. 2 seconds to drive the backrest to horizontal position. Check that the spindle nut does not touch the cog wheel or potentiometer.

h) Drive the guiding nut past the calibration mark a couple of times to ensure that the sensor is now calibrated correctly (the horizontal lines are aligned).

i) Exit service mode.

2.2 Calibrating lift motor position sensor

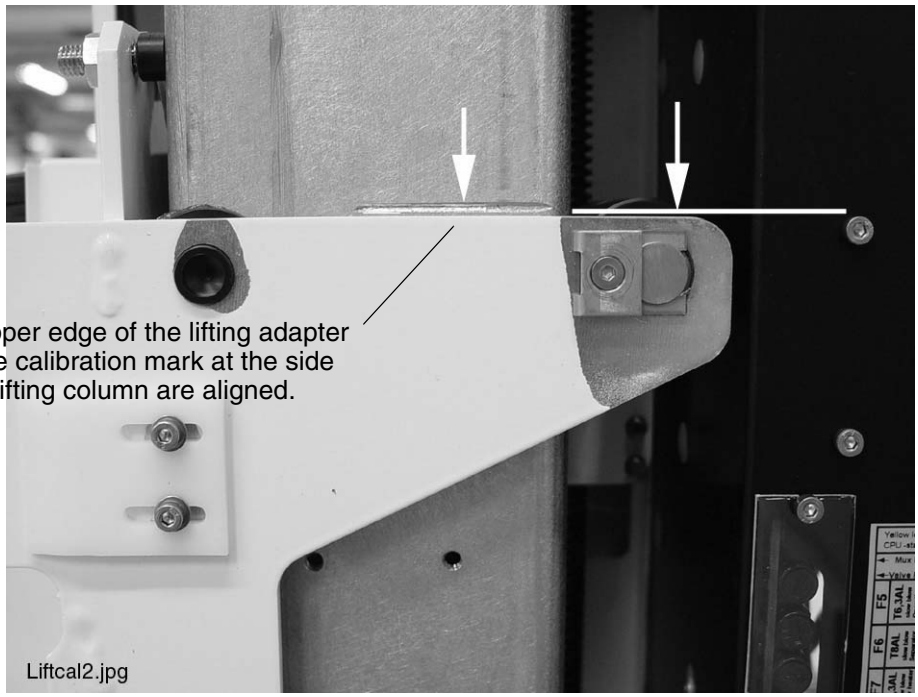
WARNING

During the calibration of the lift motor position sensor all software limits are ignored.
Special care must be taken for not to damage the unit by driving the lifting adapter to its mechanical limits.

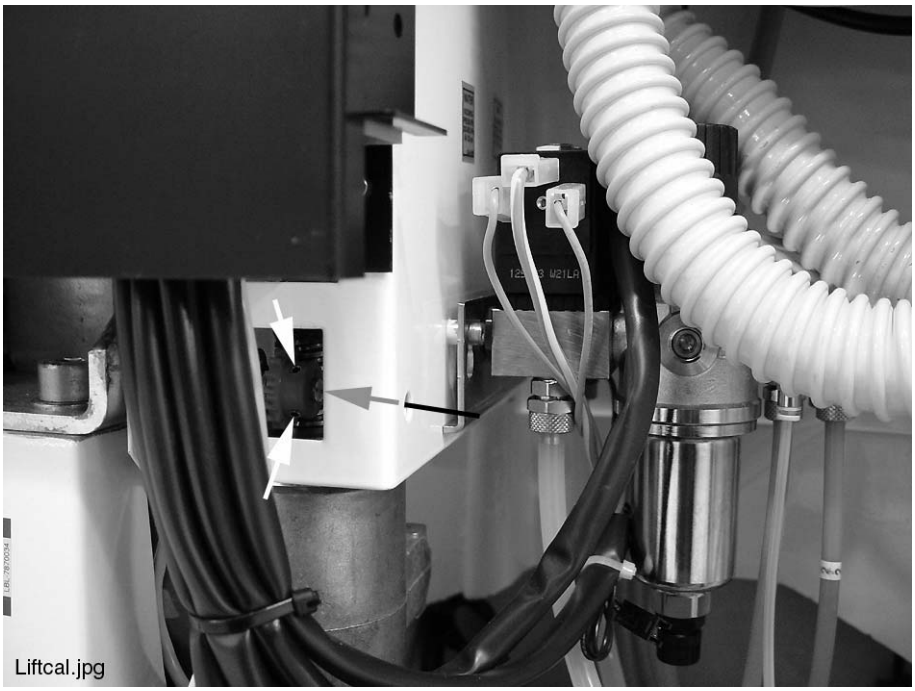
a) Enter service mode 79. The display will show letter L (for lift motor) followed by two horizontal lines.

b) Enable lift motor movements by holding down the spit position key for 10 seconds.

c) Using the C and D keys from the control panel, drive the lifting adapter to position where the upper edge of the adapter and the calibration mark at the side of the lifting column are aligned.


The upper edge of the lifting adapter and the calibration mark at the side of the lifting column are aligned.
Liftcal2.jpg

d) Loosen the two M3x6 DIN 916 screws holding the cog wheel of the sensor in position.



e) Rotate the axle of the sensor with a screwdriver until the two horizontal lines on the display are in line.

The sensor presumes the lifting adapter to be at a too low position.

Rotate the axle counterclockwise (seen from the axle).

The sensor is calibrated correctly.

The sensor presumes the lifting adapter to be at a too high position.

Rotate the axle clockwise (seen from the axle).

f) Tighten the two M3x6 DIN 916 screws to secure the cog wheel into position.

g) Drive the lifting adapter past the calibration mark a couple of times to ensure that the sensor is now calibrated correctly.

h) Exit service mode.

2.3 Rewiring mains voltage selection jumper

WARNING

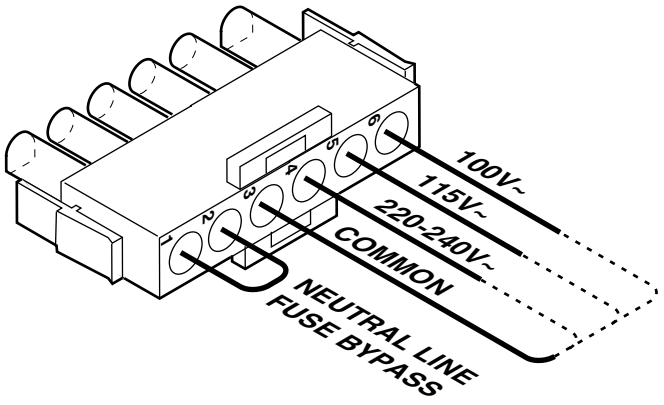
Erroneously wired voltage selection jumper may cause serious damage to the equipment.

The mains voltage selector jumper (connector P21 on the Main control PCB) is used to select the transformer winding to correspond with the mains voltage. Since the transformer is connected using the back-to-back method, the same transformer can be used for different mains voltages. Voltage selection jumpers for different mains voltages can also be ordered as spare parts.

a) Select the mains voltage by connecting pin 3 and one of the pins 4…6 together.

The same voltage setting jumper is also used to bypass the neutral line fuse. In some areas it is not allowed to have a fuse in the neutral wire, thus the neutral line fuse must be bypassed.

b) Bypass the neutral line fuse by connecting the pins 1 and 2 together.



CONNECTED PINS	SELECTED MAINS VOLTAGE
3 & 6	100V~
3 & 5	115V~
3 & 4	220-240V~

3 PNEUMATICAL ADJUSTMENTS

3.1 Adjusting internal water & air pressures

The filter/regulators control the internal water and air pressures. There are two ways to monitor the pressures while adjusting the regulators: manually with a manometer (pressure gauge) or using the unit's own pressure sensors. The manometer is connected to the head of the syringe handpiece and the pressures are adjusted similarly as explained for adjusting the pressures using the unit's own pressure sensors.

Air pressure

a) Enter service mode 38. **Press the A-key** to enter the air pressure mode. The unit automatically closes down the main water valve and releases the internal water pressure via the flush valve into the drain. The internal air pressure is shown on the display. The pressure is shown in bars (1bar = 100kPa = 14.5psi).

b) Lift the cap of the air filter/regulator upwards and adjust the internal air pressure by turning the regulator cap. Balance the pressure from the syringe air valve after every adjustment. The factory preset value for the internal air pressure is 5.5 bar.

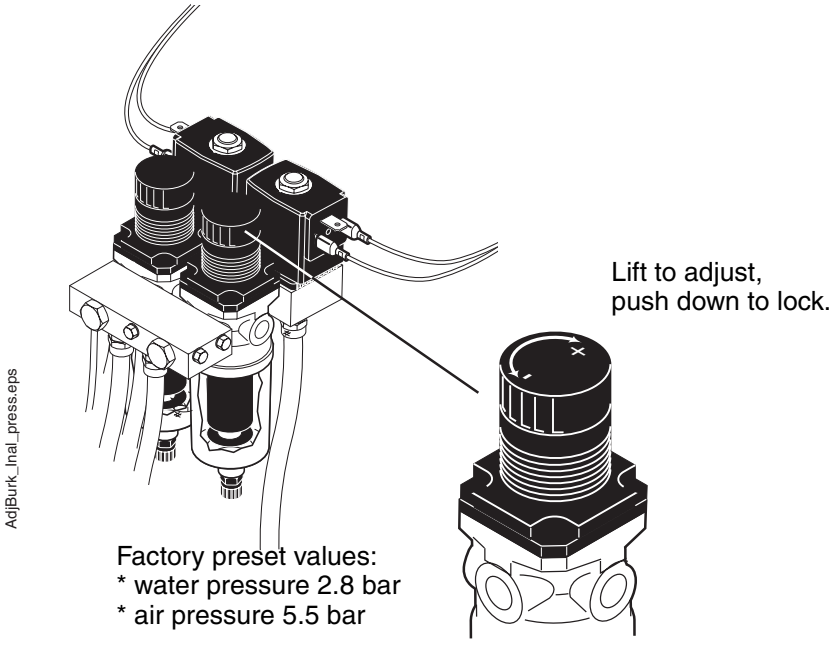
c) Lock the filter/regulator to the adjusted position by pushing down the regulator cap.

Water pressure

a) Enter service mode 38. **Press the B-key** to enter the water pressure mode. The unit automatically closes down the main air valve and releases the internal air pressure via the instrument multiplexer. The internal water pressure is shown on the display. The pressure is shown in bars (1bar = 100kPa = 14.5psi).

b) Lift the cap of the water filter/regulator upwards and adjust the internal water pressure by turning the regulator cap. Balance the pressure from the syringe water valve after every adjustment. The factory preset value for the internal water pressure is 2.8 bar.

c) Lock the filter/regulator to the adjusted position by pushing down the regulator cap.



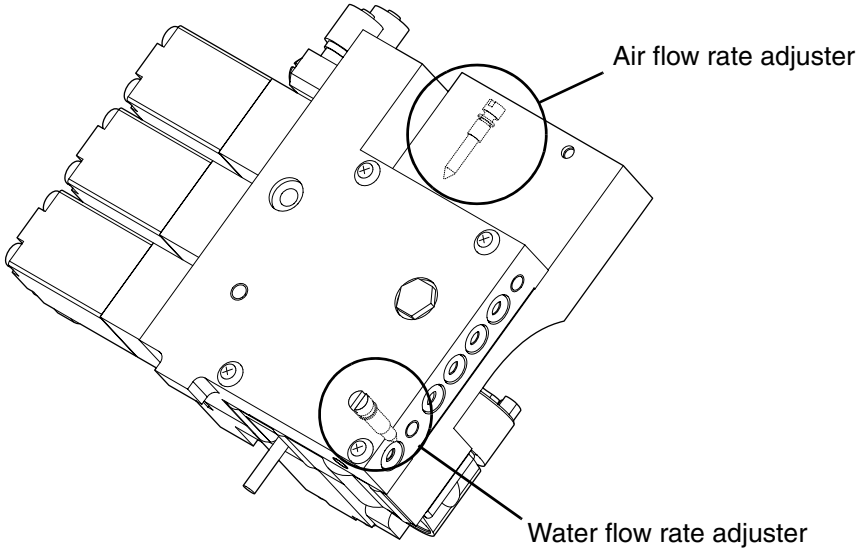
3.2 Adjusting syringe water and air flow rates

The water and air flow rates for the syringe are adjusted from the two brass screws located on the syringe instrument multiplexer block. Both the water and air flows for the syringe can also be blocked by these screws.

a) Open the instrument console cover by unscrewing the M6x16 DIN 7984 screw from under the instrument console and open the console cover.

b) Adjust the syringe water flow rate from the water flow rate adjuster on the top of the syringe instrument multiplexer block. Observe the adjusted flow rate with the syringe instrument.

c) Adjust the syringe air flow rate from the air flow rate adjuster on the instrument arm side of the syringe instrument multiplexer block. Observe the adjusted flow rate with the syringe instrument.

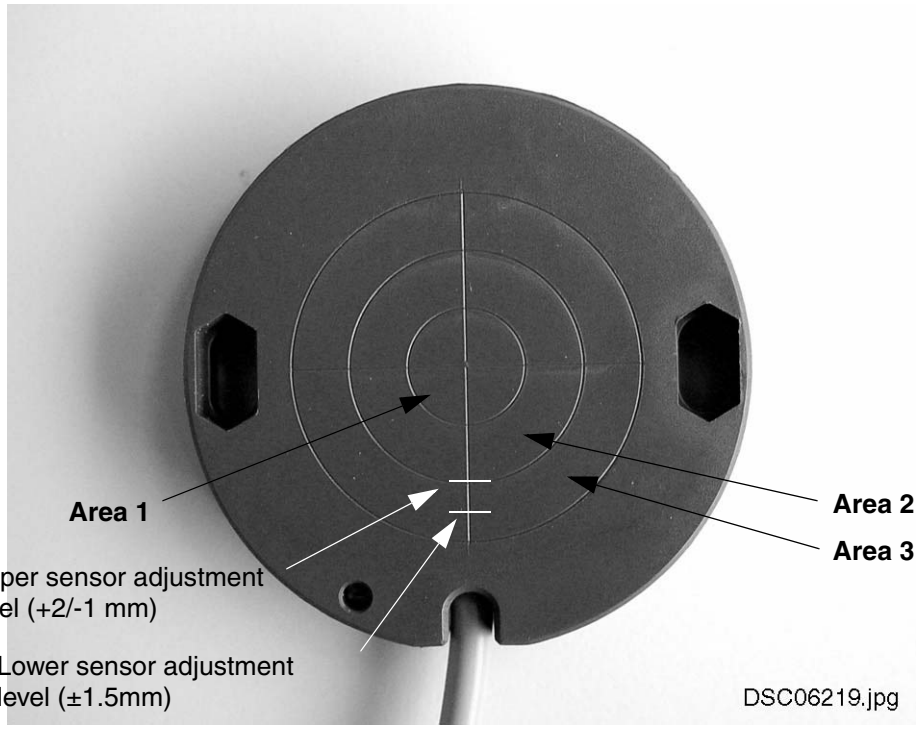


3.3 Adjusting coolants to the instruments

The water and air flow rates for each instrument are adjusted in the instrument settings program mode. Please refer to the User's manual (publication part number 288037) for programming the instrument settings.

4 WATER MANAGEMENT SYSTEM: ADJUSTING THE SENSORS

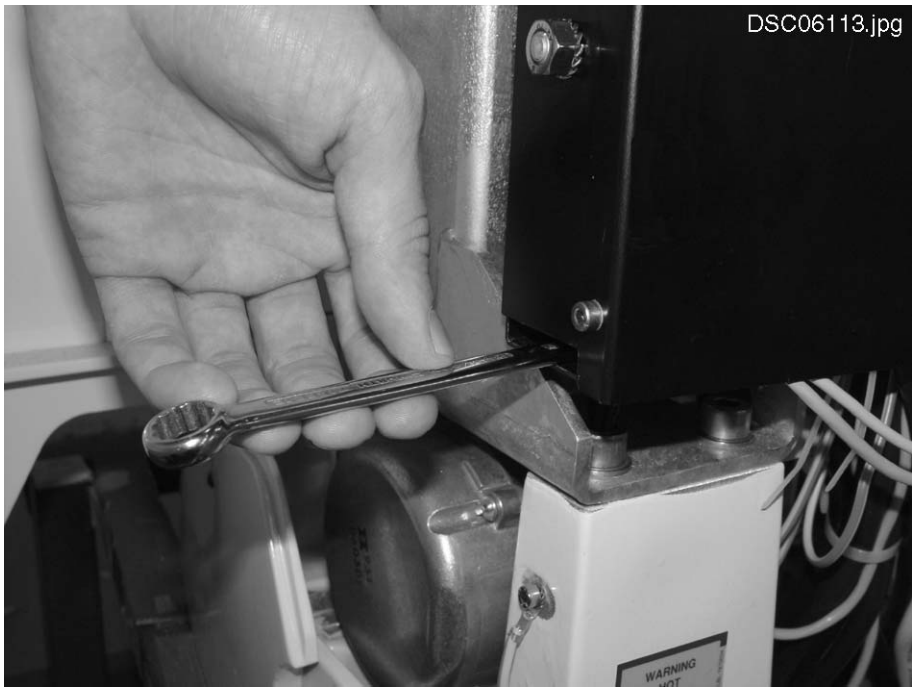
To the sensor surface are marked three circles. The inner area is number 1, the next is 2 an so on.



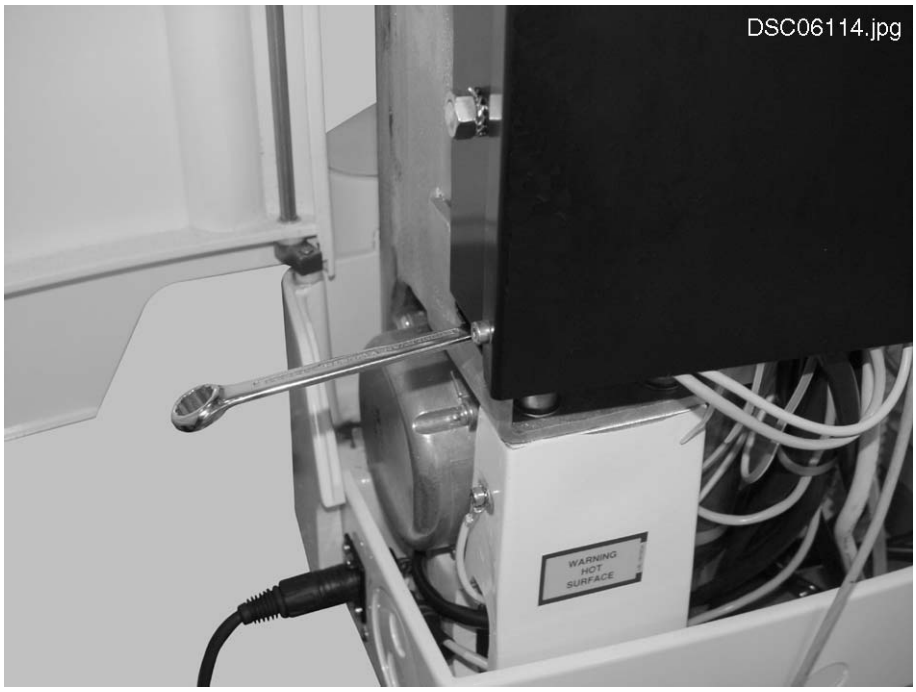
4.1 Preparations before adjustment

- Open the cuspidor door.
- Add some Planosil solution or coloured water (with e.g. caramel) to the container.
- Switch on the Clean water mode and switch on the container (bottle) switch.

- Pass the door switch by pushing e.g a fork spanner into the electronics control box as shown on the figure below.



- The fork spanner is pressing the door switch and the WMS operates also with door open.



4.2 Adjusting the lower sensor

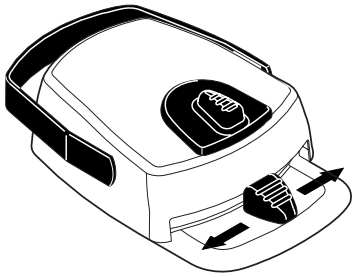
- Switch off the Clean water mode.
- Let the pump operate until the water level is in the middle of the area 2 (- 1 / + 2 mm) on the lower sensor. Switch on the Clean water mode. The plus (+) direction is the water rising direction.
- The sensor adjustment screw is located on the side of the sensor. Adjust the sensor so that it just recognizes the water level: the sensor light first go on and then goes off and remains off.

4.3 Adjusting the upper sensor

- Switch off the Clean water mode.
- Let the pump operate until the water level is at the border between areas 2 and 3 of the upper sensor (±1.5mm).
- The sensor adjustment screw is located on the side of the sensor. Adjust the sensor so that it just recognizes the water level: the sensor light first go on and then goes off and remains off.

5 BLEEDING OF THE SPRAY WATER SYSTEM

- Activate the instrument (turbine or micromotor).
- Press the instrument spray key to turn on the spray water.
- Operate the activated instrument with foot control.



- Loosen the bleeding screw until the water bleeds out (while the instrument is running).

NOTE ***If the water is not bleeding out properly then loosen the two nuts a little. When the bleeding is done then tighten the nuts again.***

- Tighten the bleeding screw so the the water flow stops.
- Release the foot control and return the instrument to its place.
- Remove the label attach the console cover and place the instrument on its position.

NOTE ***Always make sure that the instrument hose is correct to the used instrument. The control system identifies the instrument hose, not the instrument. The control system does not recognize the instrument change.***

NOTE ***Make sure that the hoses are properly connected to the console to avoid leakage.***

Chapter

G

PARTS REPLACEMENT & REPAIR

1 REMOVING COVERS

Cuspidor door

a) Open the cuspidor door.

b) Release the door opening limiter by unscrewing the M4x8 DIN 912 screw.

c) Lift the console arm side of the cuspidor top cover, unscrew the attachment screw and remove the door joint sleeve.

d) Remove the cuspidor door by tilting it away from the cuspidor.

e) Assemble the cuspidor door into position in reverse order.

Cuspidor cover

a) Remove the side cover plate from the side of the cuspidor by pulling it away from the cuspidor.

b) The cuspidor cover is attached to the cuspidor with Velcro tapes and attachment pins. First detach the cover at the chair adapter side of the cuspidor by pulling it outwards. Then pull the cover outwards at the other side of the cuspidor (see picture on the next page).

c) Assemble the cuspidor cover into position in reverse order.

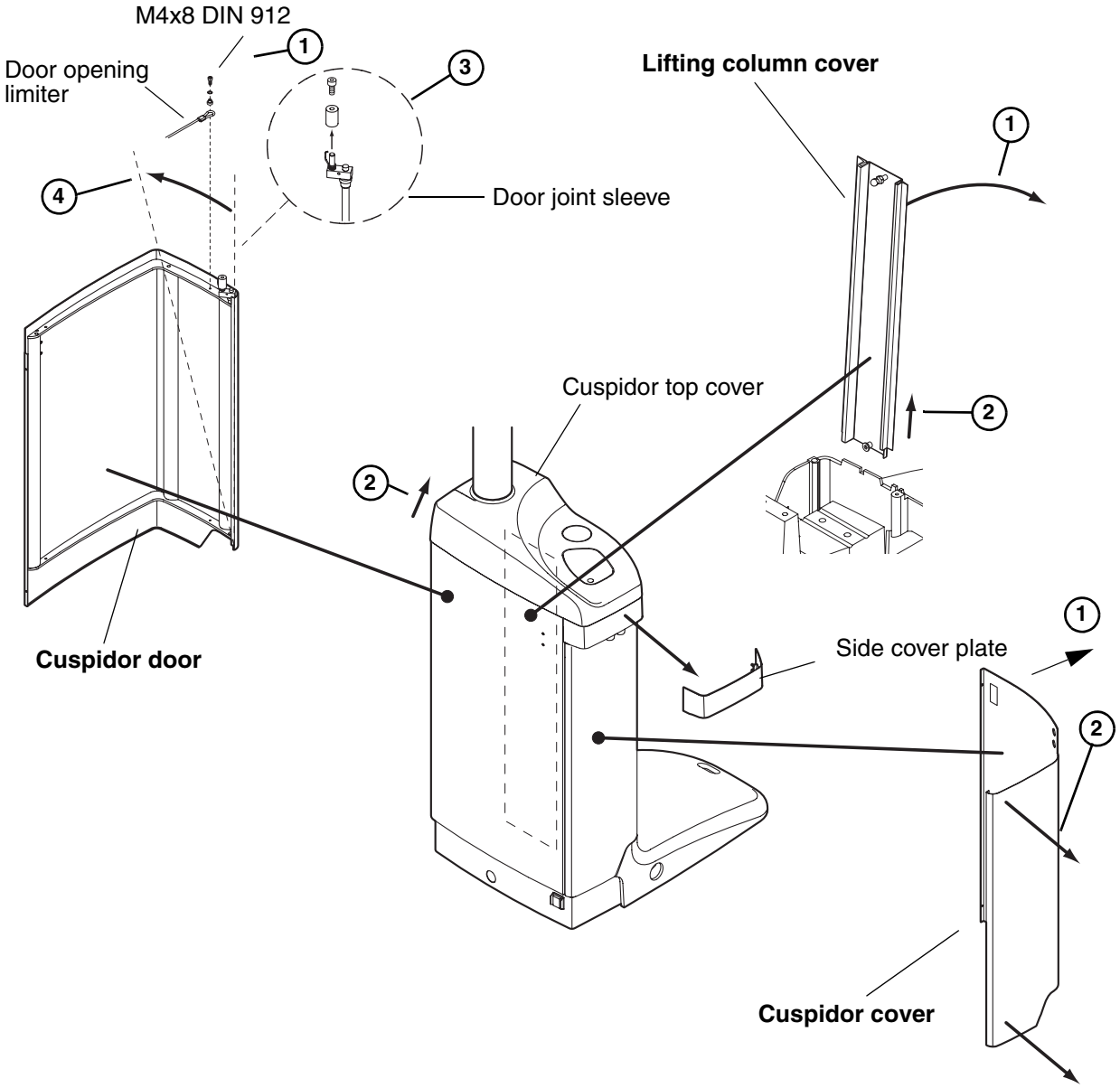
Lifting column cover

a) Drive the patient chair to its lowest position.

b) Detach the upper side of the lifting column cover by carefully bending it towards the chair.

c) Remove the lifting adapter by pulling it upwards.

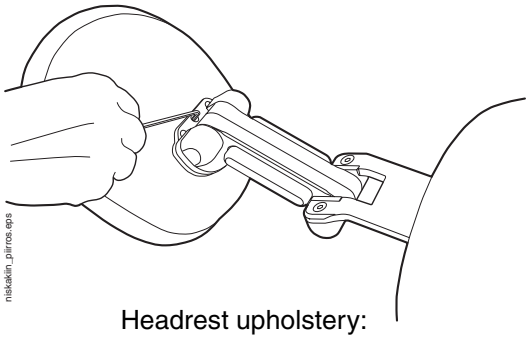
d) Assemble the lifting column adapter into position in reverse order.



2 UPHOLSTERIES REPLACEMENT

Headrest upholstery

a) Loosen the screw at the back of the headrest assembly.
b) Detach the headrest upholstery from the headrest assembly.
c) Attach the new headrest upholstery in reverse order.

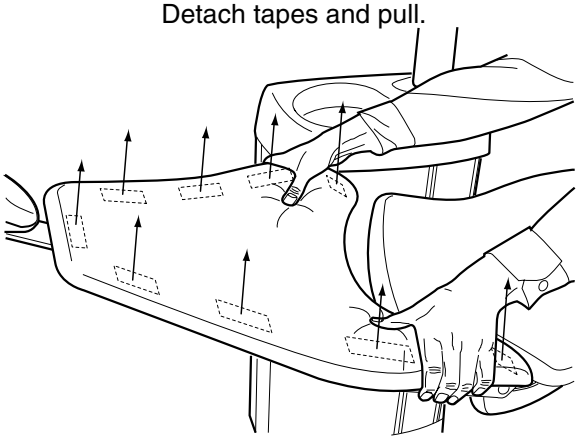


Headrest upholstery:
Loosen the screw and remove the cushion.

Backrest upholstery

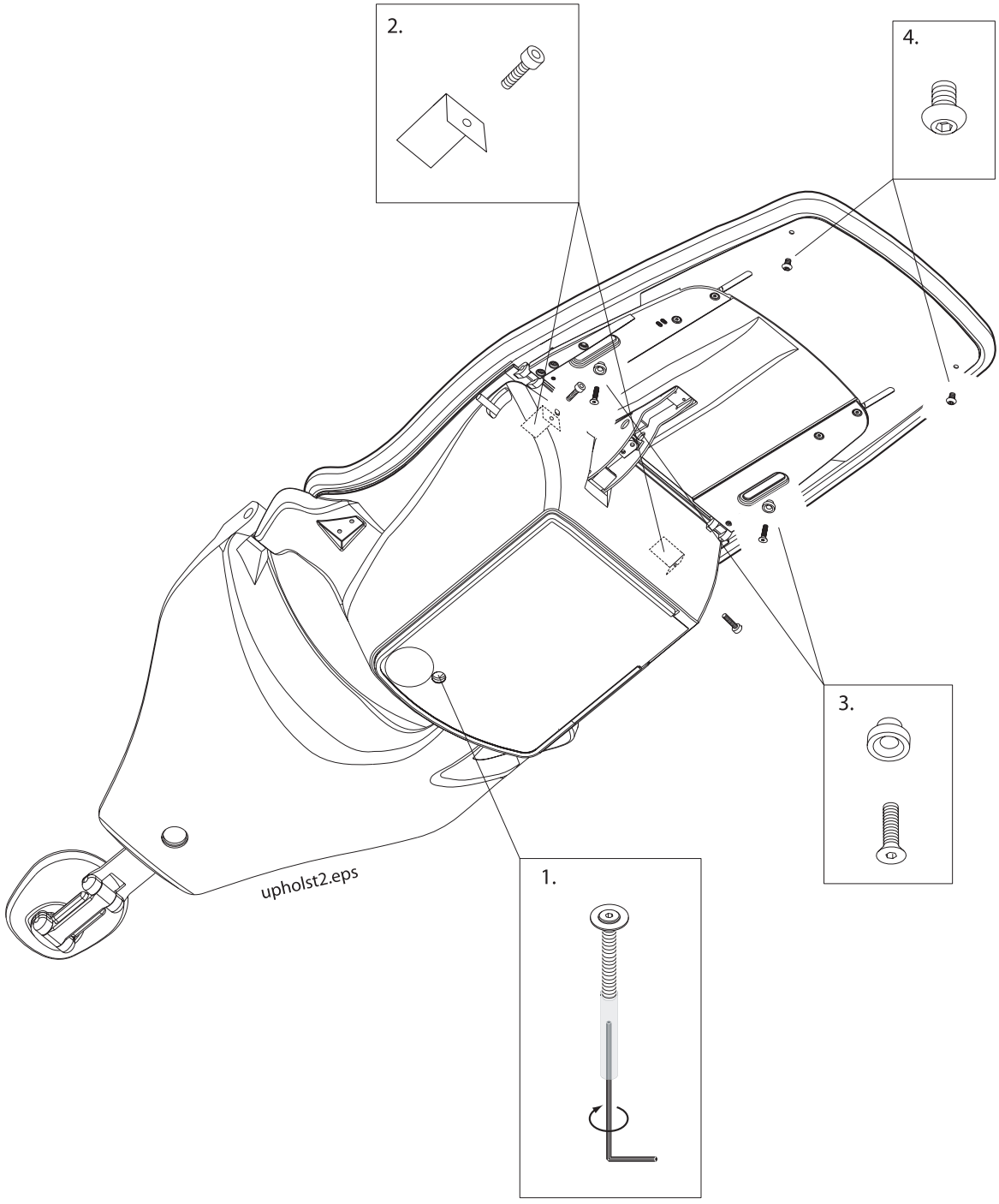
a) Detach the lower corners of the backrest upholstery and remove the upholstery by pulling it.
b) Attach the new backrest upholstery by bending it carefully from its sides and aligning it properly during the attaching. Press first the center of the upholstery into position and then the edges to attach all the tapes to their counterparts.

Backrest upholstery:
Detach tapes and pull.



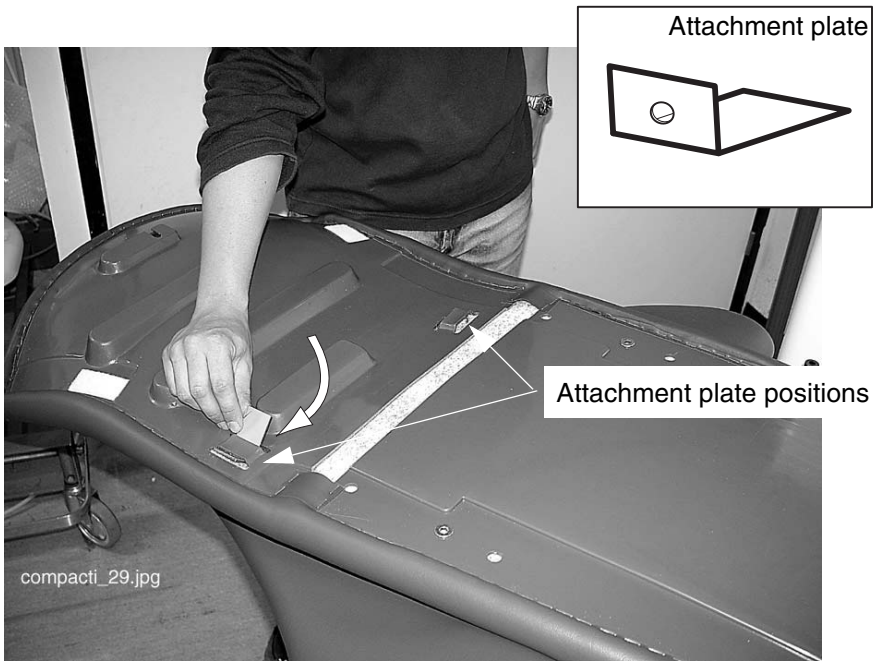
Seat upholstery

a) Loosen the attachment screw by turning it clockwise (figure below, 1). Unscrew the other six screws as shown on the figure below (2-4).



b) Slide the seat upholstery towards the footrest so that the attachment screw comes out from the groove of the upholstery's backplate. Remove the seat upholstery.

c) Slide the attachment plates to their positions at the new seat upholstery backplate as shown on the figure below.



d) Attach the new seat upholstery in reverse order.

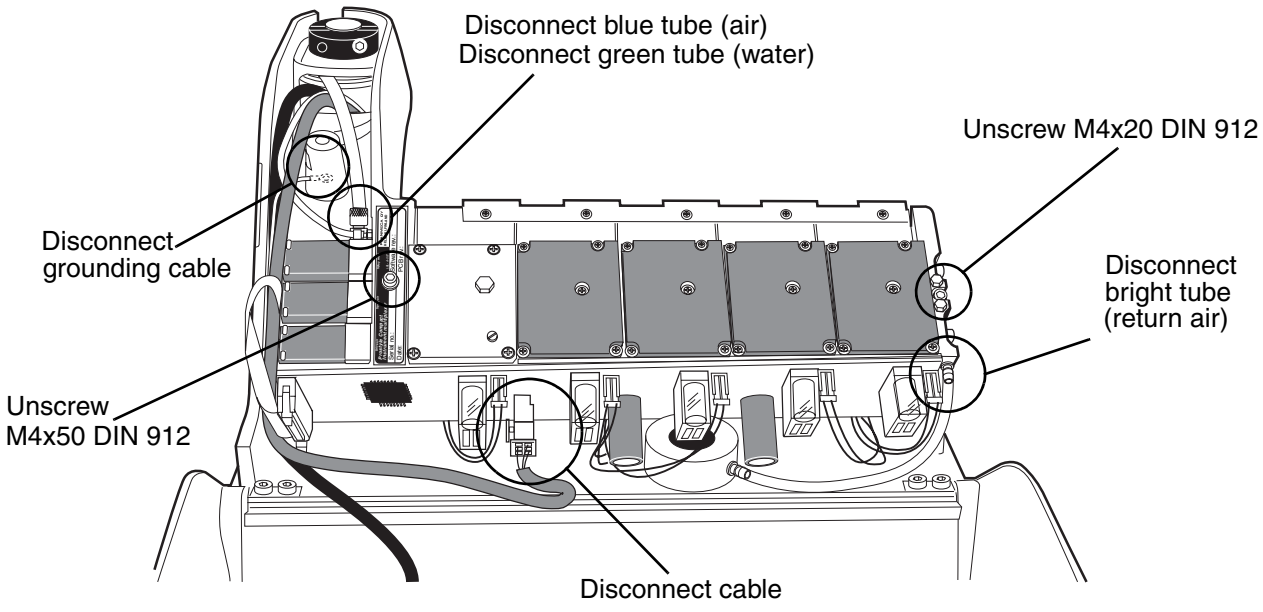
3 INSTRUMENT MULTIPLEXER RELATED

3.1 Preparations before instrument multiplexer related replacements

a) Enter service mode 13 and switch off the main water valve.
b) Decompress the water pressure with the syringe instrument.
c) Turn off the power.
d) Decompress the air pressure with the syringe instrument.
e) Remove the instrument hoses by unscrewing the quick connectors.
f) Remove the instrument arms by pushing them from their positions.
g) Unscrew the M6x16 DIN 7984 screw from under the instrument console and open the console cover.

3.2 Replacing the whole multiplexer

a) Perform the pre-replacement preparations described in section 3.1 “Preparations before instrument multiplexer related replacements” on page G-6.
b) Disconnect the blue tube (air) from the angle nipple.
c) Disconnect the green tube (water) from the nipple.
d) Disconnect the bright tube (instrument return air) from the nipple.
e) Disconnect the Instrument multiplexer cable from the connector P11 on the Instrument multiplexer PCB.
f) Disconnect the Console grounding cable from the instrument console casting by unscrewing the M4x8 DIN 912 screw.
g) Unscrew the M4x50 DIN 912 and M4x20 DIN 912 screws from sides of the multiplexer assembly.
h) Lift the multiplexer assembly from the console casting.
i) Install the new multiplexer assembly in reverse order.
j) Bleed the multiplexer according to the instruction described in chapter F, section 5 “BLEEDING OF THE SPRAY WATER SYSTEM” on page F-29.



3.3 Replacing one multiplexer block (other than syringe)

CAUTION ***Care must be taken when removing and installing the multiplexer block for not to damage the quick connector pins that are attached to the Instrument multiplexer PCB.***

NOTE ***Avoid bending the Instrument multiplexer PCB when removing and installing the multiplexer block.***

a) Perform the pre-replacement preparations described in section 3.1 “Preparations before instrument multiplexer related replacements” on page G-6.

b) Remove the multiplexer assembly from the console casting as described in section 3.2 “Replacing the whole multiplexer” on page G-6.

c) Unscrew the five TORX WN1451 3x6 PT screws and remove the multiplexer plate.

d) Disconnect the instrument control valve (of the multiplexer block in question) from the connector on the Instrument multiplexer PCB.

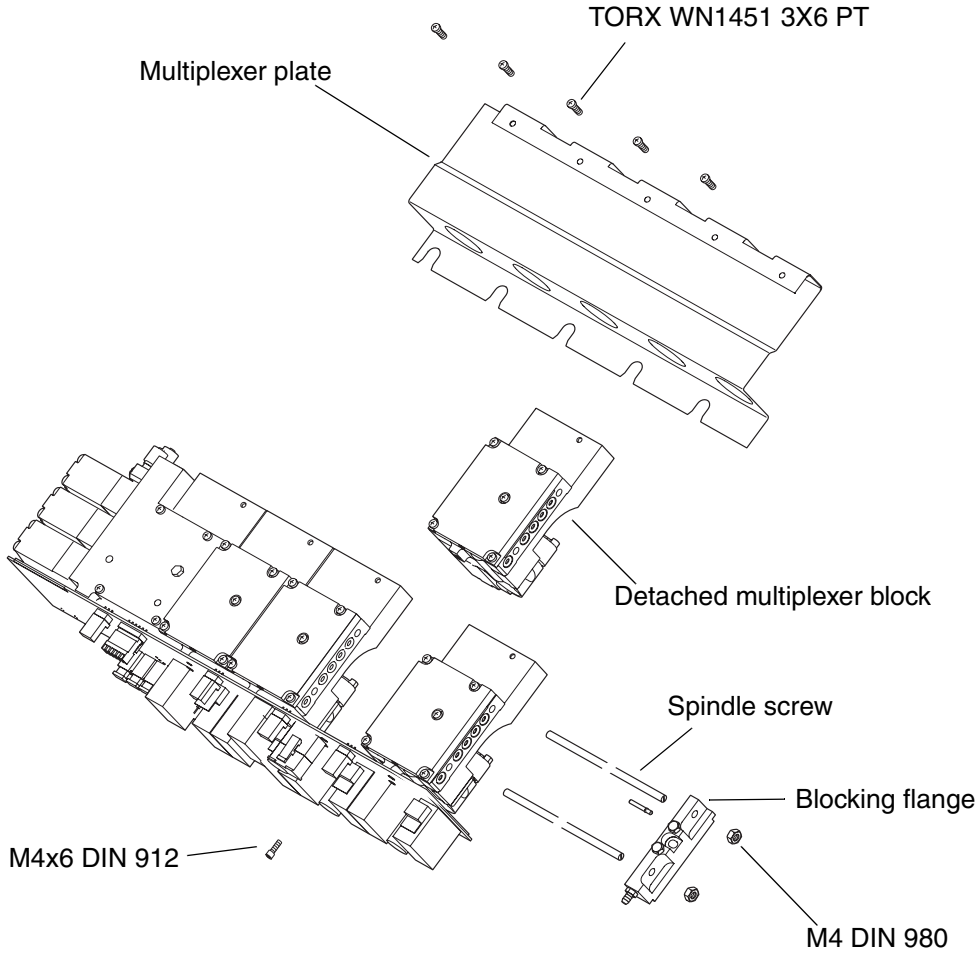
e) Unscrew the two M4 DIN980 nuts that keep the multiplexer blocks connected together. Remove the blocking flange and unscrew the two spindle screws.

f) Unscrew the M4x6 DIN 912 screw that connects the multiplexer block in question to the Instrument multiplexer PCB.

g) Remove the multiplexer block in question from the multiplexer assembly by pulling it to the direction away from the Instrument multiplexer PCB.

h) Install the new multiplexer block in reverse order.

i) Bleed the multiplexer according to the instruction described in chapter F, section 5 “BLEEDING OF THE SPRAY WATER SYSTEM” on page F-29



3.4 Replacing multiplexer control membrane

Every multiplexer block, except the syringe (next to the control panel) has a control membrane, which blocks air and water for the instrument (instrument not active).

NOTE ***Care must be taken to position the new multiplexer control membrane correctly.***

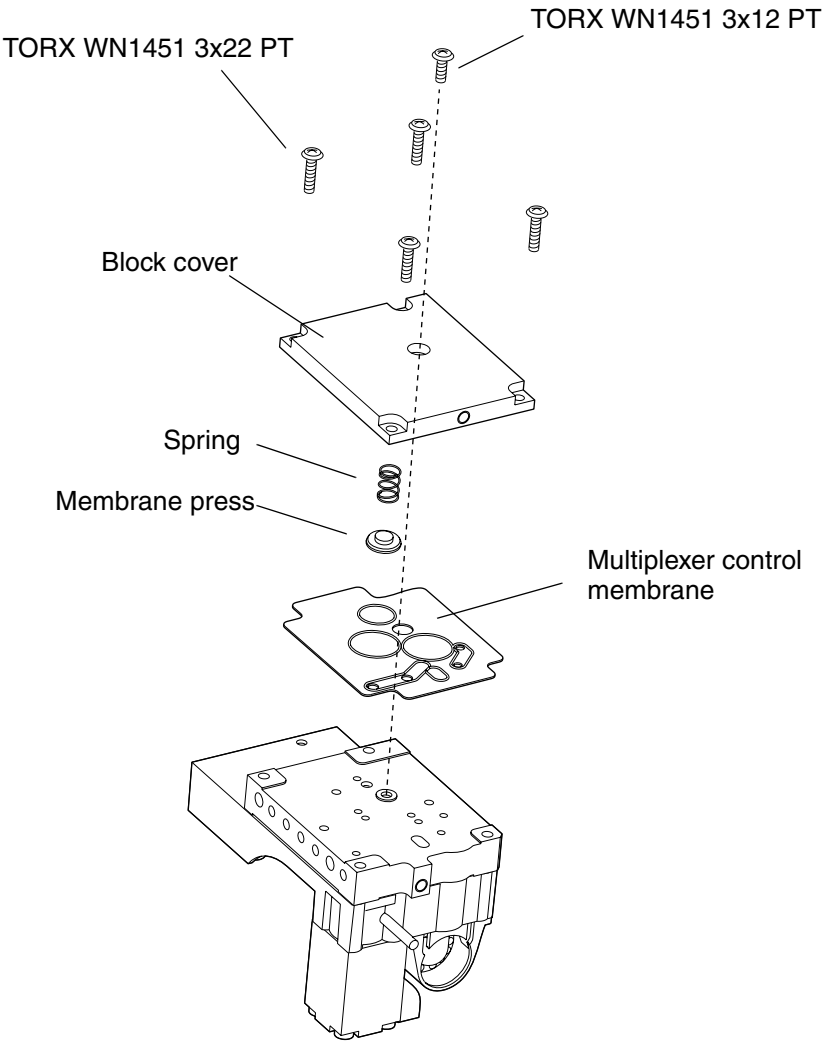
NOTE ***Carefully tighten the screws equally and crosswise when repositioning the multiplexer block cover. Using too much force might damage the threads in the multiplexer block.***

a) Perform the pre-replacement preparations described in section 3.1 “Preparations before instrument multiplexer related replacements” on page G-6.

b) Unscrew the four TORX WN1451 3x22 PT screws and one TORX WN1451 3x12 PT screw from the multiplexer block to be repaired and remove the block cover.

c) Remove the spring and membrane press.

d) Install the new control membrane in reverse order.



3.5 Replacing instrument control valve

Every multiplexer block has an instrument control valve (located next to the quick connector housing). For instruments other than the syringe, the function of the valve is to control the multiplexer control membrane and by that means water and air to the instrument. For the syringe instrument, the valve controls directly water to the instrument.

a) Perform the pre-replacement preparations described in section 3.1 “Preparations before instrument multiplexer related replacements” on page G-6.

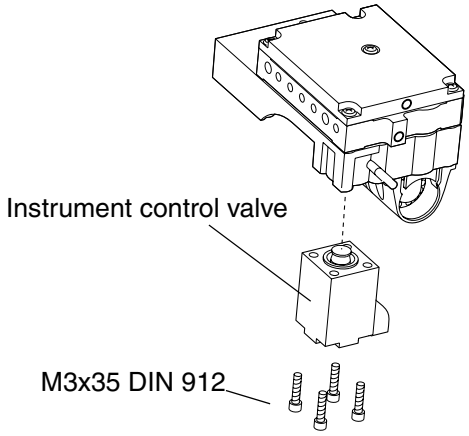
b) Remove the multiplexer assembly from the console casting as described in section 3.2 “Replacing the whole multiplexer” on page G-6.

c) Remove the multiplexer plate as described in section 3.3 “Replacing one multiplexer block (other than syringe)” on page G-7.

d) Disconnect the instrument control valve cable from the Instrument multiplexer PCB.

e) Unscrew the four M3x35 DIN 912 screws and remove the valve.

f) Install the new instrument control valve in reverse order.



3.6 Replacing instrument multiplexer proportional valves

There are three instrument multiplexer proportional valves located at the control panel end of the multiplexer assembly. The function of the valves is to control water and air to the whole multiplexer.

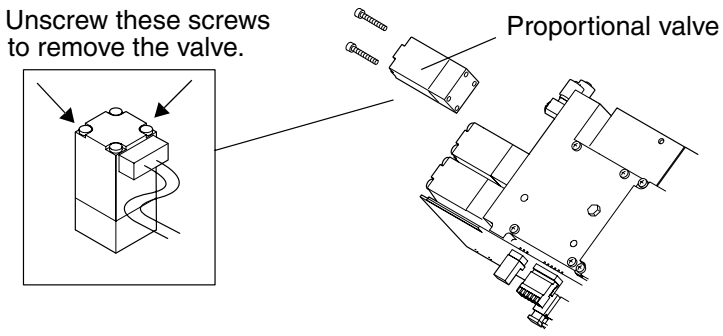
a) Perform the pre-replacement preparations described in section 3.1 “Preparations before instrument multiplexer related replacements” on page G-6.

b) Disconnect the proportional valve cable from the Instrument multiplexer PCB for the valve in question.

c) If replacing the spray water proportional valve, disconnect the grounding cable that is connected to the valve with one of the four screws.

d) Unscrew the two of the four screws and remove the valve.

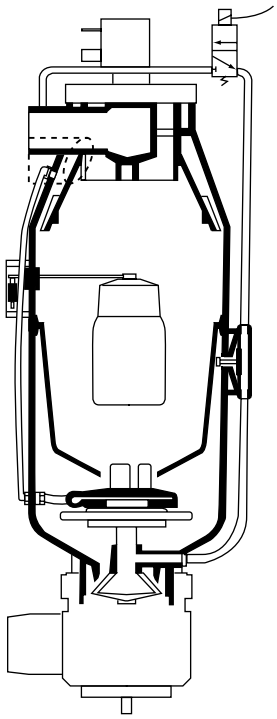
e) Install the new proportional valve in reverse order.



4 SUCTION SYSTEM RELATED

4.1 Function of the PM Microvac II separating tank

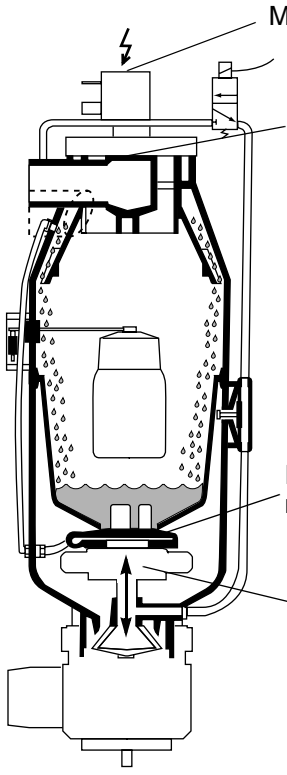
Idle situation



Electrical function:
No control voltage is connected to any of the valves, suction motor stopped (if controlled by the unit).

Pneumatical function:
All the membranes are open.

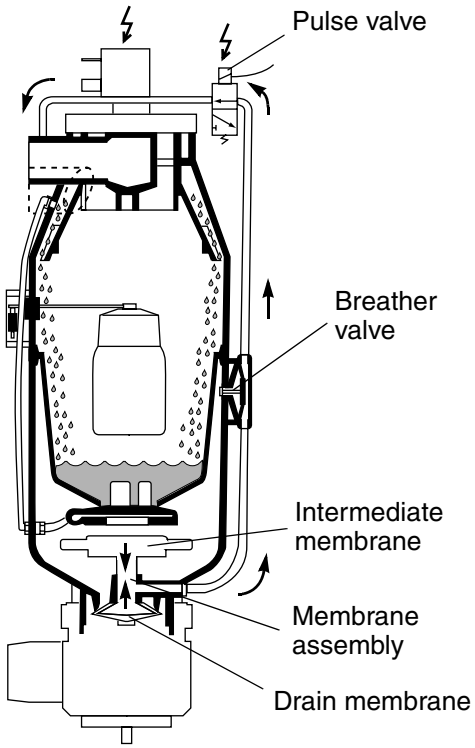
Suction hose removed from the holder



Electrical function:
The suction motor relay connects on the Main control PCB and the suction motor starts (if controlled by the unit). Control voltage is connected to the microvac and flushing valves.

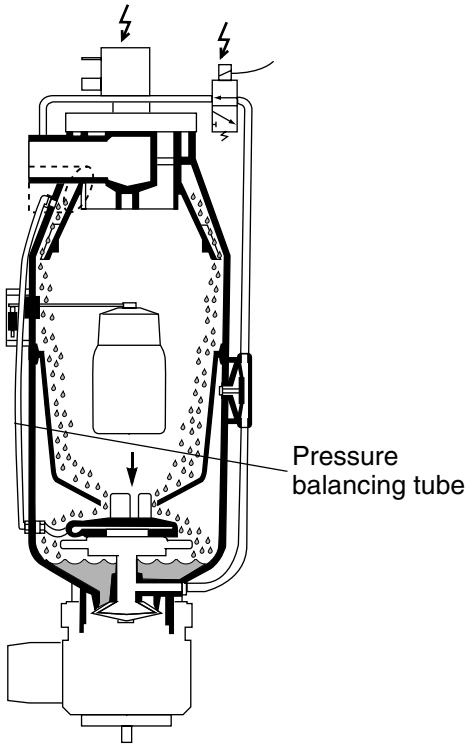
Pneumatical function:
The microvac valve enables the suction closing membrane to connect the vacuum to the upper chamber (and to the suction hose). The intermediate membrane is forced to expand by the vacuum in the upper chamber. The pressure balancing membrane over the intermediate membrane moves upwards and blocks the opening between the upper chamber and the lower chamber. Saliva and water begins to gather into the upper chamber.

Pulse valve opens (after every five seconds)



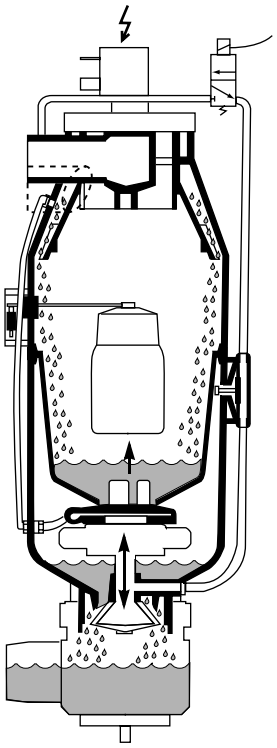
Electrical function:
Control voltage is connected to the microvac, pulse and flushing valves.

Pneumatical function:
The vacuum is connected to the membrane assembly (drain and intermediate membranes). The intermediate membrane is forced to shrink by the vacuum. The pressure balancing membrane stays in position (due to the pressure difference between the chambers) preventing water from flowing to the lower chamber. The drain membrane blocks the opening from the lower chamber to the drain. The vacuum also closes the breather valve.



After about 0.5 seconds the pressure difference between the chambers is balanced by the pressure balancing tube. The pressure balancing membrane moves downwards due to gravity allowing saliva and water to flow to the lower chamber.

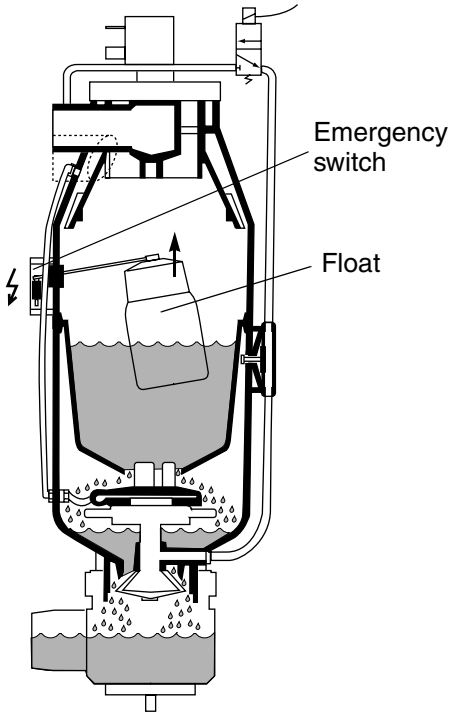
Pulse valve closes (after every five seconds)



Electrical function:
Control voltage is no longer connected to the pulse valve.

Pneumatical function:
The vacuum in the upper chamber forces the intermediate membrane to expand, thus the pressure balancing membrane blocks the opening between the upper and lower chambers. The breather valve opens, since the pulse valve no longer connects the vacuum to the membrane of the breather valve. The drain membrane opens allowing water to flow into the drain.

Overfill situation



Electrical function:
The emergency switch connects and cuts the control voltage from all the valves related to the separating tank.

Pneumatical function:
The liquid level in the upper chamber reaches the critical point and the float pushes the microswitch. All the membranes are open and water flows to the drain from both the chambers. Since the main valve is closed, the vacuum is not led to the tank nor the suction tubes. The suction will start again after five seconds delay, supposing that the liquid level has fallen below the critical level.

4.2 Replacing the whole PM Microvac II separating tank

WARNING

Used separating tank includes saliva and bacteria. Always wear protective clothing when handling the separating tank.

a) Turn off the unit. In the case that suction motor is not controlled by the unit, turn off the suction motor.

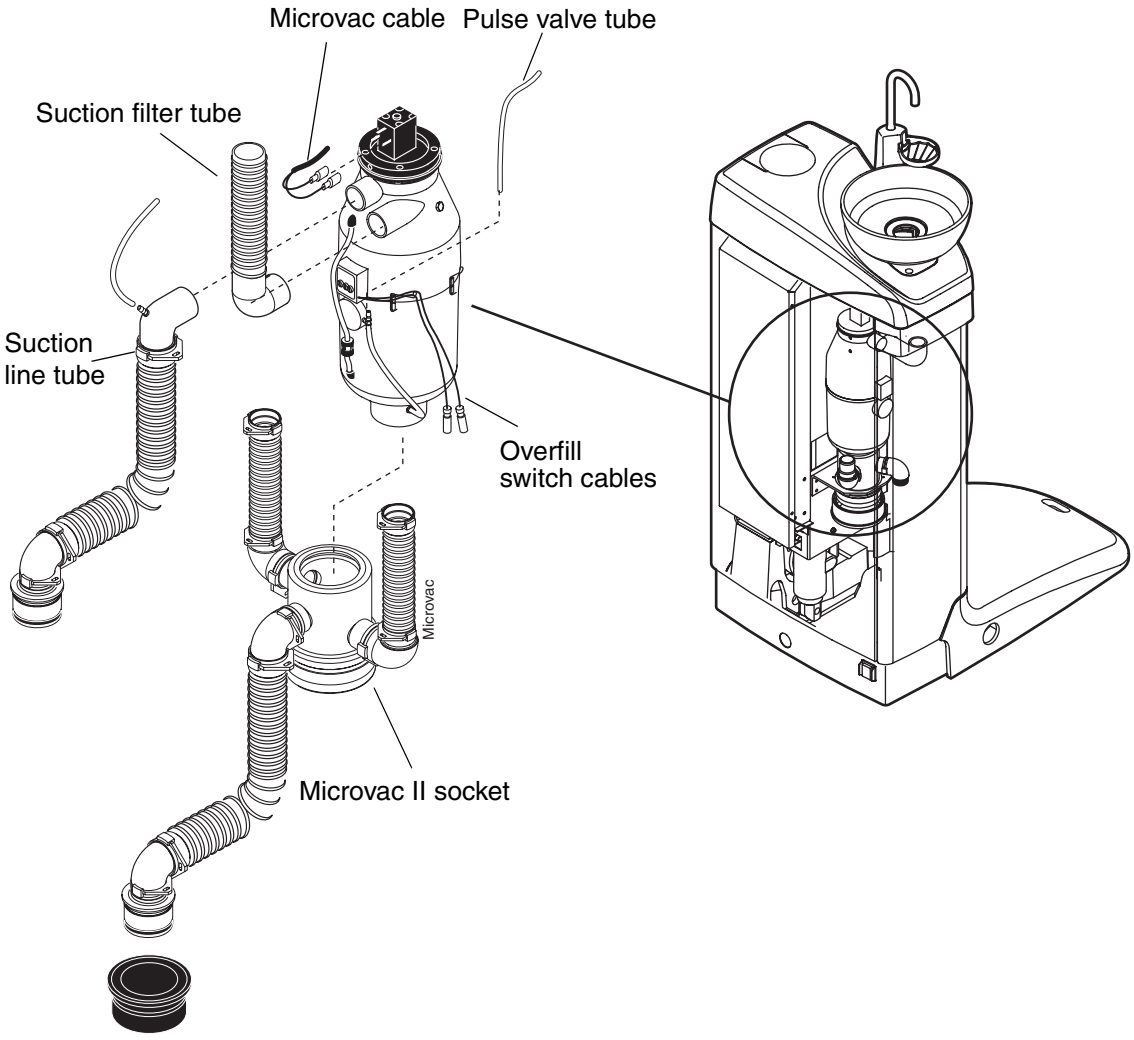
b) Detach the suction line and the suction filter tubes from the separating tank.

c) Disconnect the microvac cable from the microvac valve and disconnect the overfill switch cables.

d) Disconnect the pulse valve tube from the front of the separating tank.

e) Lift the separating tank from the socket.

f) Install the new separating tank in reverse order.



4.3 Replacing pressure balancing membrane

a) Detach the Microvac II separating tank from the unit as described in section 4.2 “Replacing the whole PM Microvac II separating tank” on page G-13.

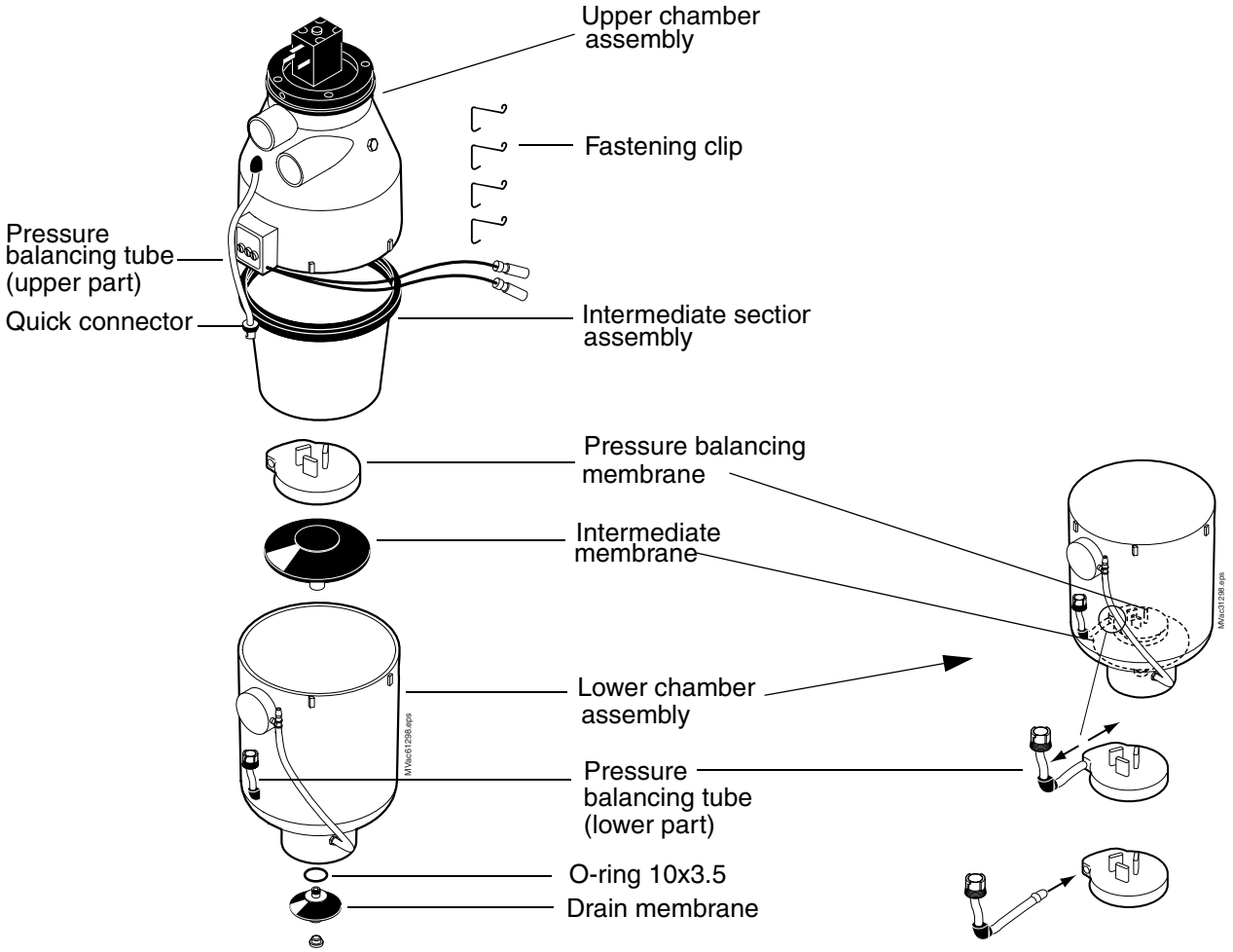
b) Disconnect the upper part of the pressure balancing tube from the lower part.

c) Detach the four fastening clips and lift off the upper chamber assembly.

d) Lift off the intermediate section assembly.

e) Detach the old pressure balancing membrane from the lower part of the pressure balancing tube inside the lower chamber as shown below.

f) Install the new pressure balancing membrane in reverse order.



4.4 Replacing intermediate and/or drain membrane

a) Detach the Microvac II separating tank from the unit as described in section 4.2 “Replacing the whole PM Microvac II separating tank” on page G-13.

b) Remove the pressure balancing membrane as described in section 4.3 “Replacing pressure balancing membrane” on page G-14.

c) Unscrew the intermediate membrane while holding the drain membrane in position. The drain membrane and the 10x3.5 O-ring will now detach.

d) Lift off the intermediate membrane from inside the lower chamber.

e) Install the new intermediate membrane and/or the new drain membrane in reverse order.

4.5 Replacing suction closing membrane

a) Detach the Microvac II separating tank from the unit as described in section 4.2 “Replacing the whole PM Microvac II separating tank” on page G-13.

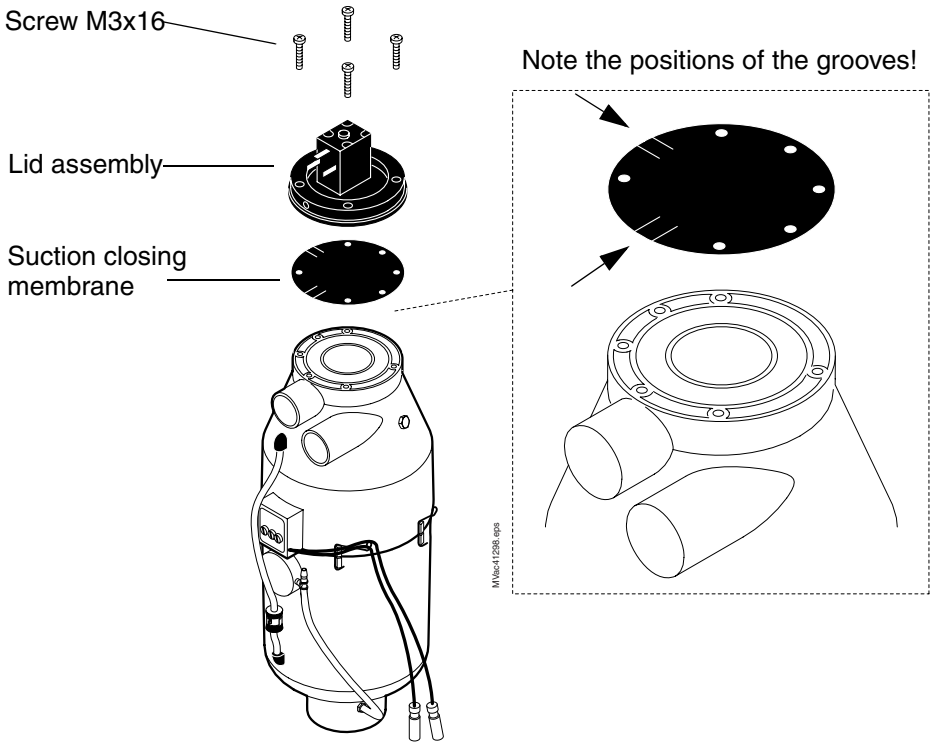
b) Remove the lid assembly by unscrewing the four M3X16 screws.

c) Lift off the old suction closing membrane.

d) Install the new suction closing membrane in reverse order.

NOTE ***Care must be taken when positioning the suction closing membrane.***

NOTE ***Tighten the lid assembly screws crosswise.***



5 ELECTRICAL PARTS REPLACEMENT

5.1 How to replace/upgrade the software

WARNING ⚠

Always turn the unit off before removing the software chip from its socket. Never turn the unit on, if the software chip is not in its socket.

NOTE ***Antistatic precautions must be performed when handling the software chip. Touch any grounded metal part of the unit before touching the software chip.***

NOTE ***The software is always downwards compatible i.e. a new software is always compatible with an older unit. However, replacing e.g. a foot control to an older unit may cause some software incompatibilities.***

a) Turn off the unit from the mains switch.

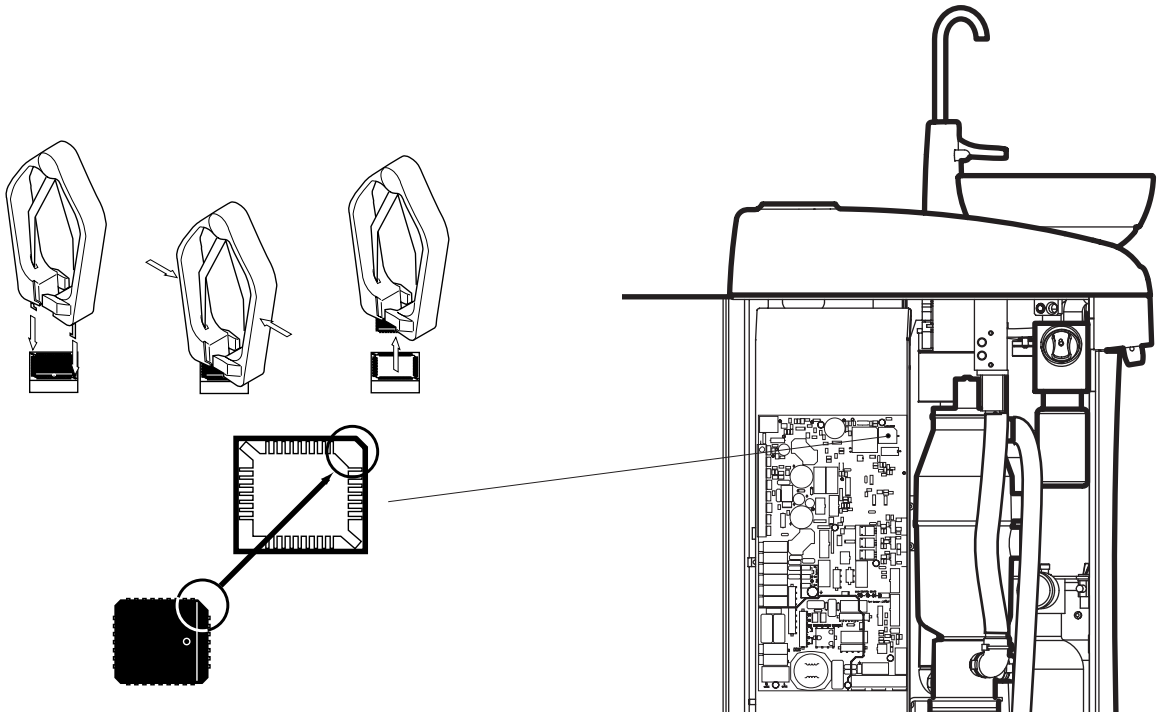
b) Remove the cover of the electronics control box as described in section 5.3 “Replacing main control PCB” on page G-18.

c) Remove the software chip from its socket with the special tool as illustrated below.

NOTE ***The orientation of the software chip is critical. Never try to force the chip into the socket.***

d) Carefully place the new software chip into the socket.

e) Assemble the cover of the electronics control box back to its position.



5.2 Replacing fuses

WARNING

Always replace fuses with the same type and rating.

Fuse Panel Code	Fuse Description	Fuse Rating & Type
F5	Operating light fuse	T6.3AL, slow blow
F6	Separator 24V~ fuse	T8AL, slow blow
F7	Water heater 24V~ fuse	T6.3AL, slow blow
F8	Syringe heater 24V~ fuse	T6.3AL, slow blow
F9	Electronics +24V Fuse A	T4AL, slow blow
F10	Electronics +24V Fuse B	T4AL, slow blow

Ratings for Mains Fuse Neutral (F11) and Mains Fuse Live (F12)

NOTE ***The mains fuse ratings depend on the selected voltage setting.***

Mains Voltage Setting	Fuse Rating & Type
100V~	12.5AT, slow blow
115V~	12.5AT, slow blow
220-240V~	6.3AT, slow blow

5.3 Replacing main control PCB

WARNING ⚠

The mains voltage is always present at the mains terminal on the main control PCB, even if the unit is switched off from its own mains switch.

a) Turn off the power supply line or disconnect the unit from the mains power source.

b) Unscrew the four M4x6 DIN 912 screws from the both sides of the electronics control box cover. Lift the cover upwards until the top of it is released and remove the cover.

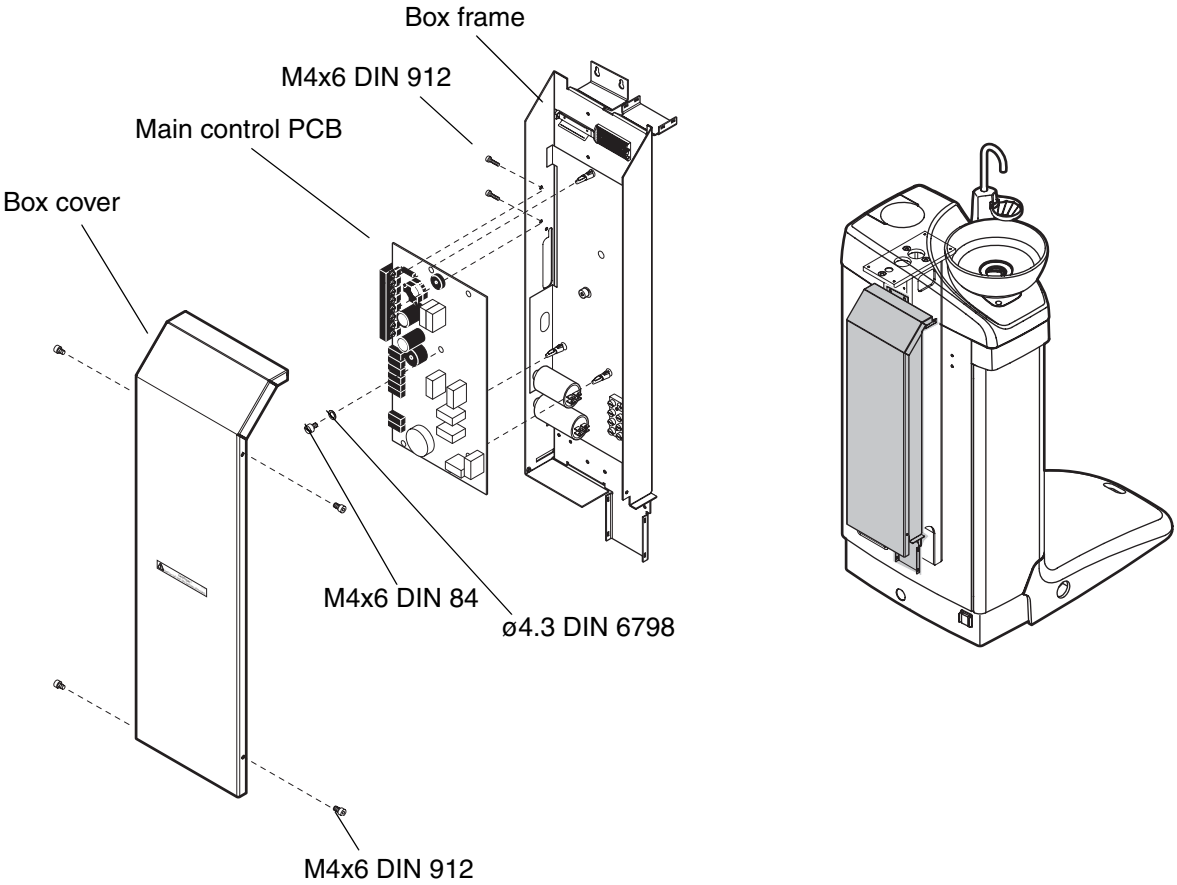
c) Disconnect all the cables that are connected to the main control PCB.

d) Unscrew the two M4x6 DIN 912 screws that connect the PCB heat sink to the box frame.

e) Unscrew the brass M4x6 DIN 84 grounding screw from next to the dental light cable connectors and remove the ø4.3 DIN 6798 washer.

f) Detach the main control PCB from the PCB holders.

g) Install the new main control PCB in reverse order. All the cable connectors, except the ones for the control panel, suction arm and foot control cables, are unique and no other cable can be connected to the connector than the one in question. All the cable connectors are also labelled.



NOTE ***After replacing the Main control PCB the dental unit automatically enters the service mode "n.100 Select dental unit type (n mode = 0, 1, 2, 3, 4, 5, 6, 7)" on page C-36 when the unit is switched on. The unit type must be selected before you can use the dental unit.***

5.4 Replacing instrument multiplexer PCB

a) Perform the pre-replacement preparations described in section 3.1 “Preparations before instrument multiplexer related replacements” on page G-6.

b) Remove the multiplexer assembly from the console casting as described in section 3.2 “Replacing the whole multiplexer” on page G-6.

c) Unscrew the five TORX WN1451 3x6 PT screws and remove the multiplexer plate.

d) Disconnect the five instrument control valve cables from the Instrument multiplexer PCB.

e) Disconnect the three proportional valve cables from the Instrument multiplexer PCB.

f) Disconnect the Pressure sensor cable from the Instrument multiplexer PCB.

g) Remove the five instrument control valves by unscrewing the M3x35 DIN 912 screws.

h) Unscrew the ten M3x8 DIN 912 screws that are holding the quick connector housings in position. Do not try to remove the quick connector housings.

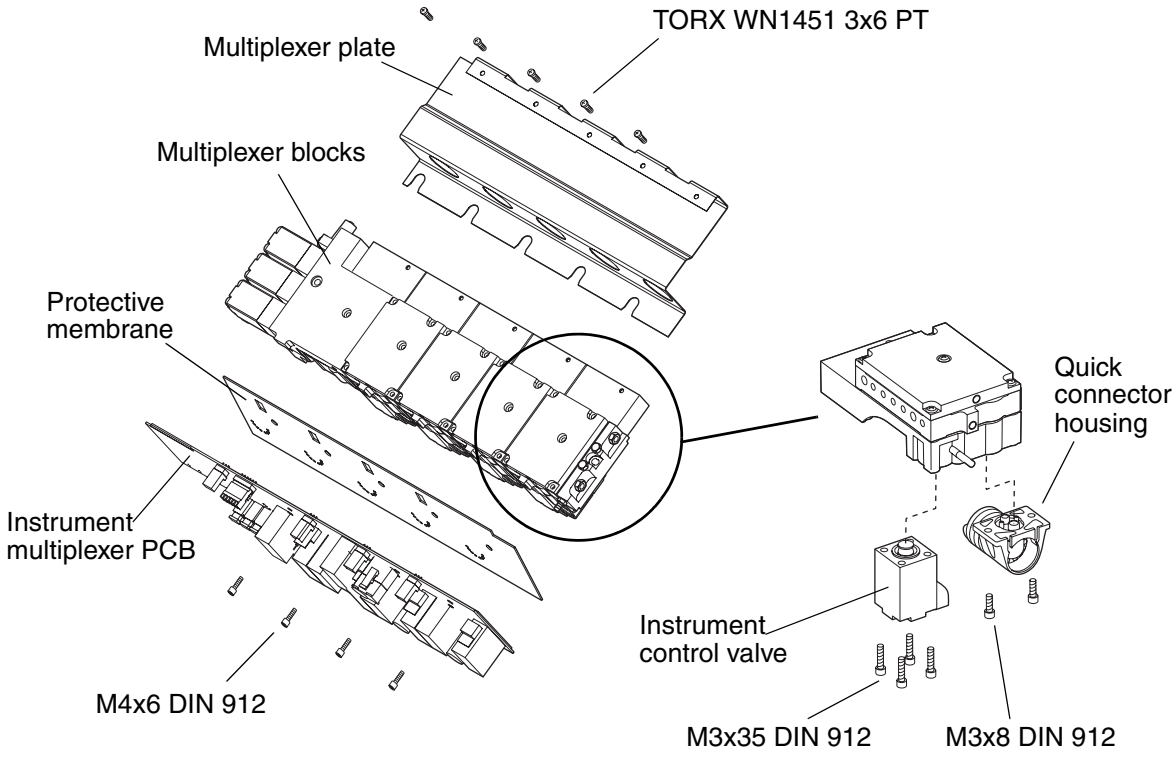
i) Unscrew the four M4x6 DIN 912 screws that connect the Instrument multiplexer PCB to the multiplexer blocks.

j) Remove the Instrument multiplexer PCB by lifting and pulling it simultaneously.

k) Carefully detach the quick connector housings from the PCB. Avoid bending the quick connector pins.

l) Install the new Instrument multiplexer PCB in reverse order.

m) Bleed the multiplexer according to the instruction described in chapter F, section 5 “BLEEDING OF THE SPRAY WATER SYSTEM” on page F-29



5.5 Replacing control panel PCB

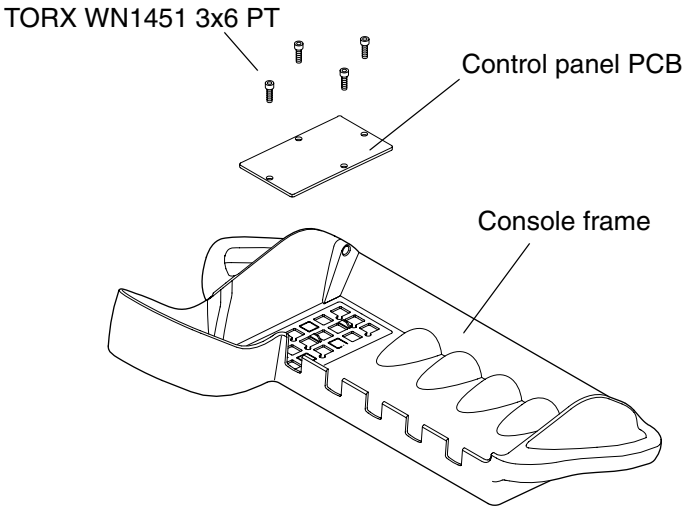
a) Unscrew the M6x16 DIN 7984 screw from under the instrument console and open the console frame.

b) Disconnect the Instrument multiplexer cable from the connector P1.

c) Disconnect the Suction arm cable from the connector P3.

d) Unscrew the four TORX WN1451 3x6 PT screws and remove the Control panel PCB.

e) Install the new Control panel PCB in reverse order.



5.6 Replacing suction sensor PCB

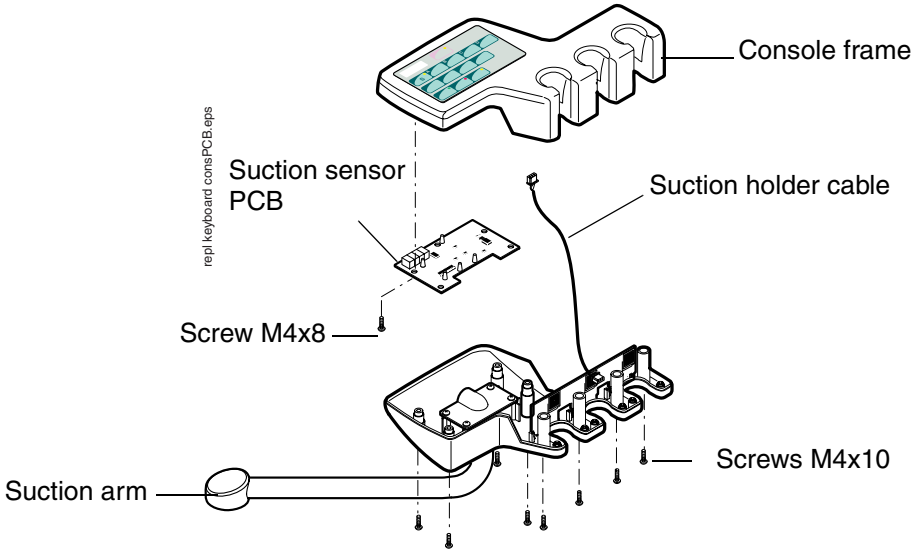
a) Unscrew the seven M4x10 PT screws from the bottom of the console.

b) Carefully open the console by pulling the two frames apart (detach the four attachment tongues at the front edge). Avoid bending the frames when opening the console.

c) Disconnect the suction holder cable from the suction sensor PCB.

d) To remove the old suction sensor PCB, unscrew the M4x8 PT screw from the bottom of the suction sensor PCB.

e) Replace the suction sensor PCB with a new one and assemble the suction arm in reverse order.

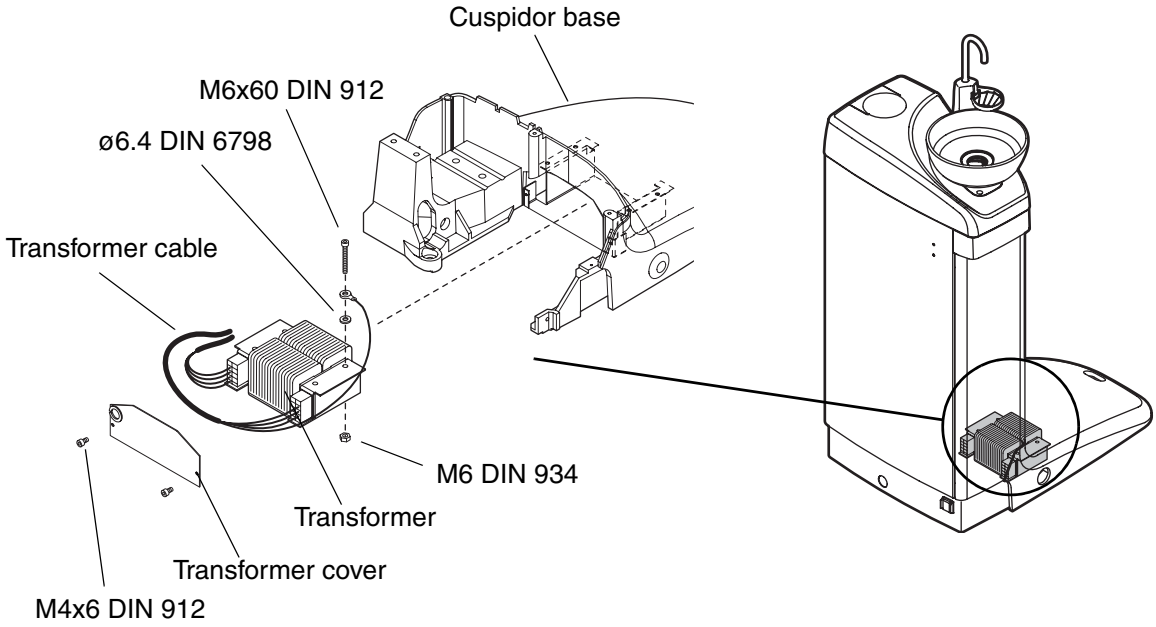


5.7 Replacing transformer

WARNING

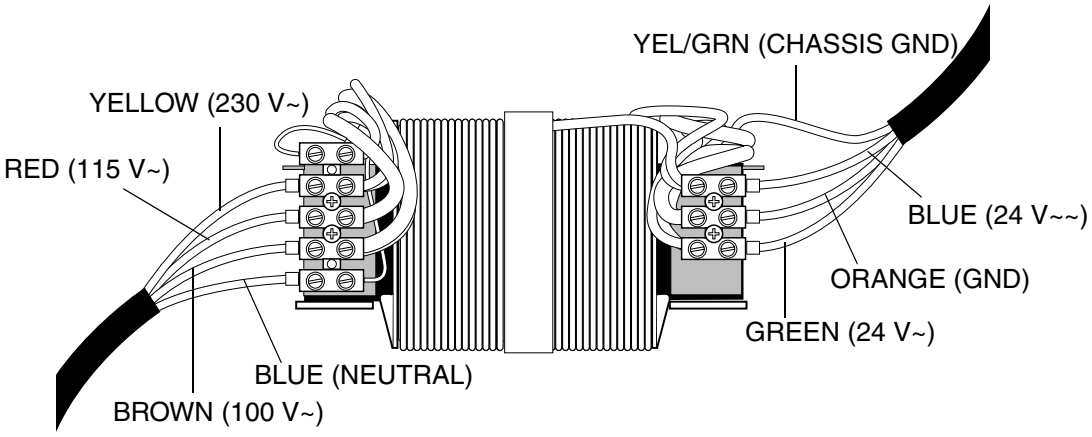
The unit must be switched off prior to transformer replacement.

a) Turn off the unit from the mains switch.
b) Unscrew the two M4x6 DIN 912 screws and remove the transformer cover.
c) Pull the transformer out from inside the cuspidor base.
d) Detach the grounding lead of the transformer cable by unscrewing the M6x60 DIN 912 screw.
e) Disconnect all the leads of the transformer cable.
f) Install the new transformer in reverse order.



TRANSFORMER CONNECTIONS

PRIMARY LEADS **SECONDARY LEADS**



5.8 Replacing position sensors

a) Drive the backrest motor or the chair lift motor to the sensor calibration position (refer to section 2.1 “Calibrating backrest motor position sensor” on page F-18 or 2.2 “Calibrating lift motor position sensor” on page F-20 respectively). Do the driving in the normal mode (not in the service mode).

b) Disconnect the position sensor cable.

c) Loosen the two M4x4 DIN 916 screws and remove the cog wheel.

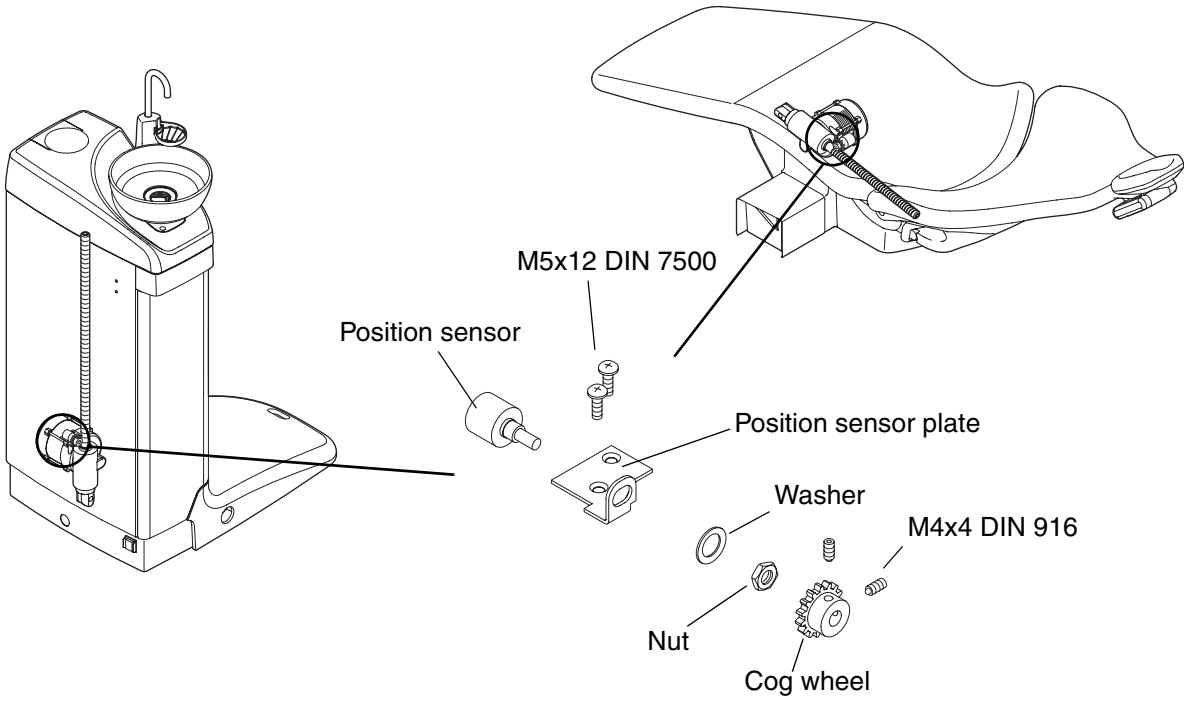
d) Remove the position sensor by unscrewing the nut.

e) Assemble the new position sensor in reverse order.

NOTE ***Never try to force the position sensor into the cog wheel, as it might cause the position sensor to break.***

NOTE ***Care must be taken when assembling the position sensor for positioning the cog wheel correctly compared to the threaded axle of the motor (see illustration below).***

f) Calibrate the new position sensor as described in section 2.1 “Calibrating backrest motor position sensor” on page F-18 or in 2.2 “Calibrating lift motor position sensor” on page F-20 section respectively.



Cog wheel too close to the threaded axle of the motor. The eccentricity of the axle damages the position sensor.

Cog wheel too far from the threaded axle of the motor. The eccentricity of the axle causes the cog wheel to slip and loose position.

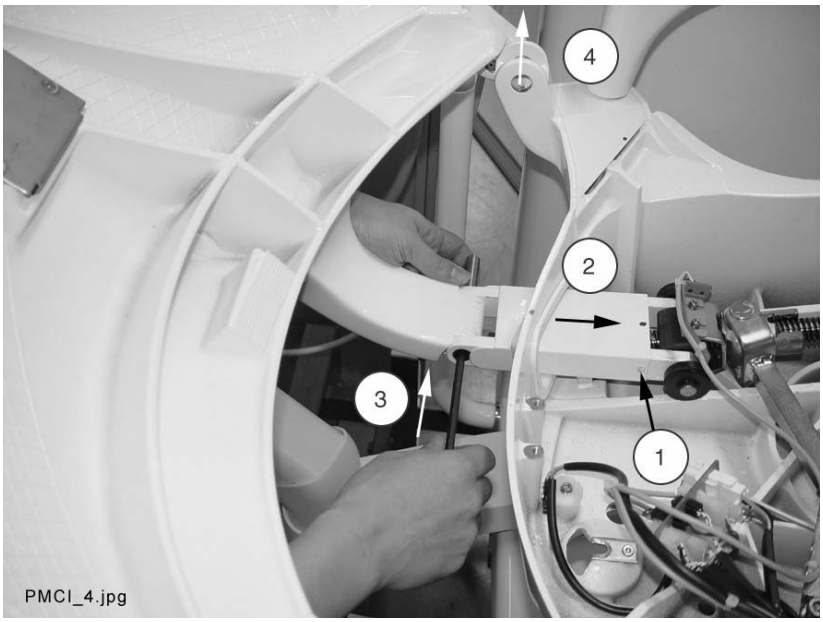
6 MOTORS REPLACEMENT

6.1 Replacing backrest motor

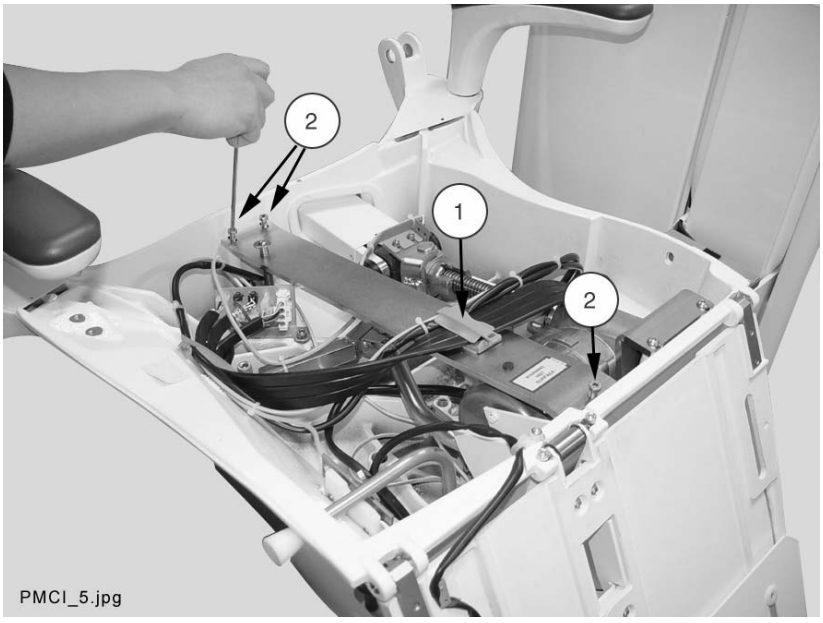
a) In the case that the motor is somewhat operational, drive the backrest to the position approx. 20° above the horizontal position.

b) Remove the backrest and seat upholsteries as described in section 2 “UPHOLSTERIES REPLACEMENT” on page G-3.

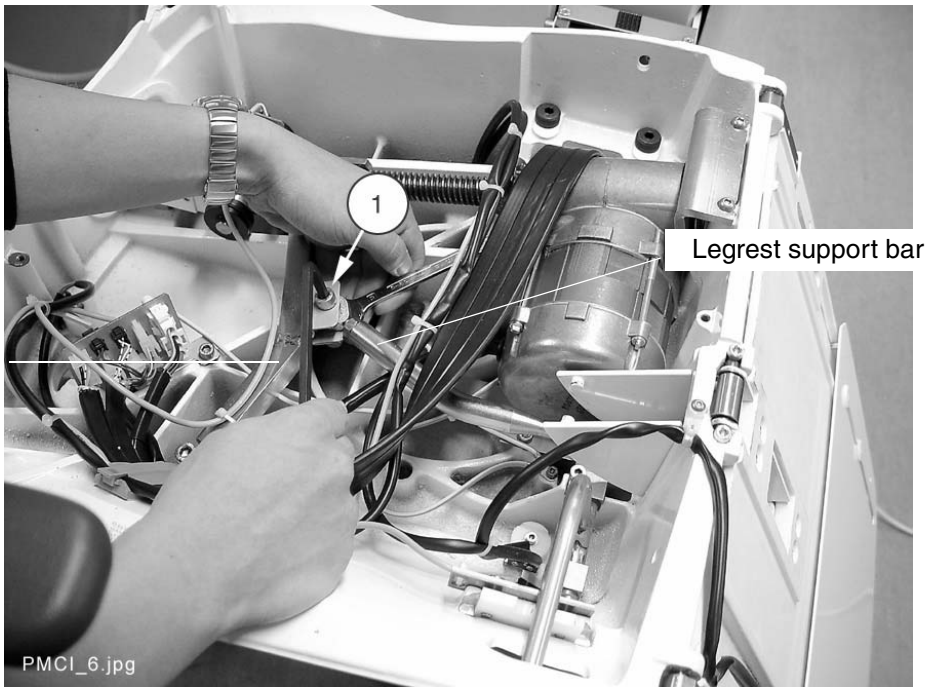
c) Unscrew the attachment screw of the pushing rod cover (1) and slide the cover towards backrest motor (2). Lift the backrest so that you can push the pushing rod pivot to away from position (3). Unscrew backrest joint pivot attachment screws using the 4mm Allen key and push the backrest joint pivots away from the joints (4). Remove the backrest.



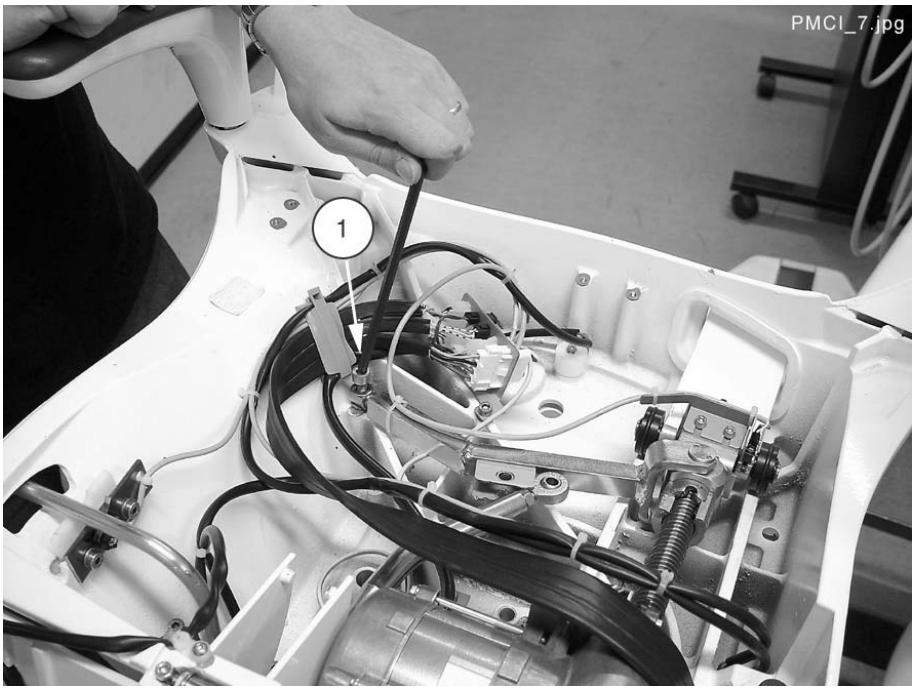
d) Open the cable clamp located on the upholstery support plate (1). Remove the upholstery support plate by unscrewing the three M6x10 DIN 912 screws (2).



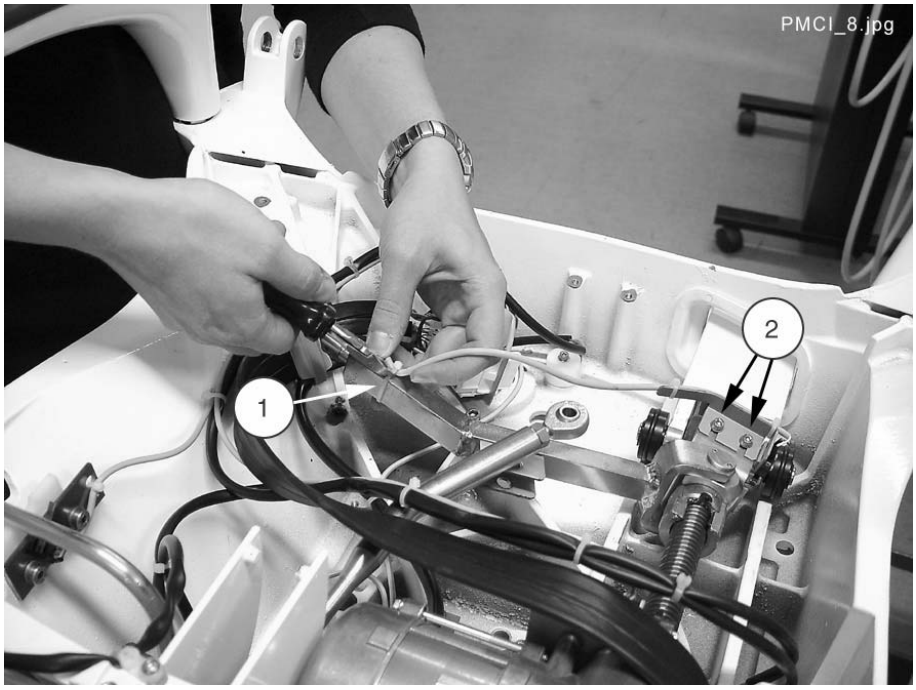
e) Detach the legrest support bar from the spindle fork assembly by unscrewing the attachment screw using the 6mm Allen key (1).



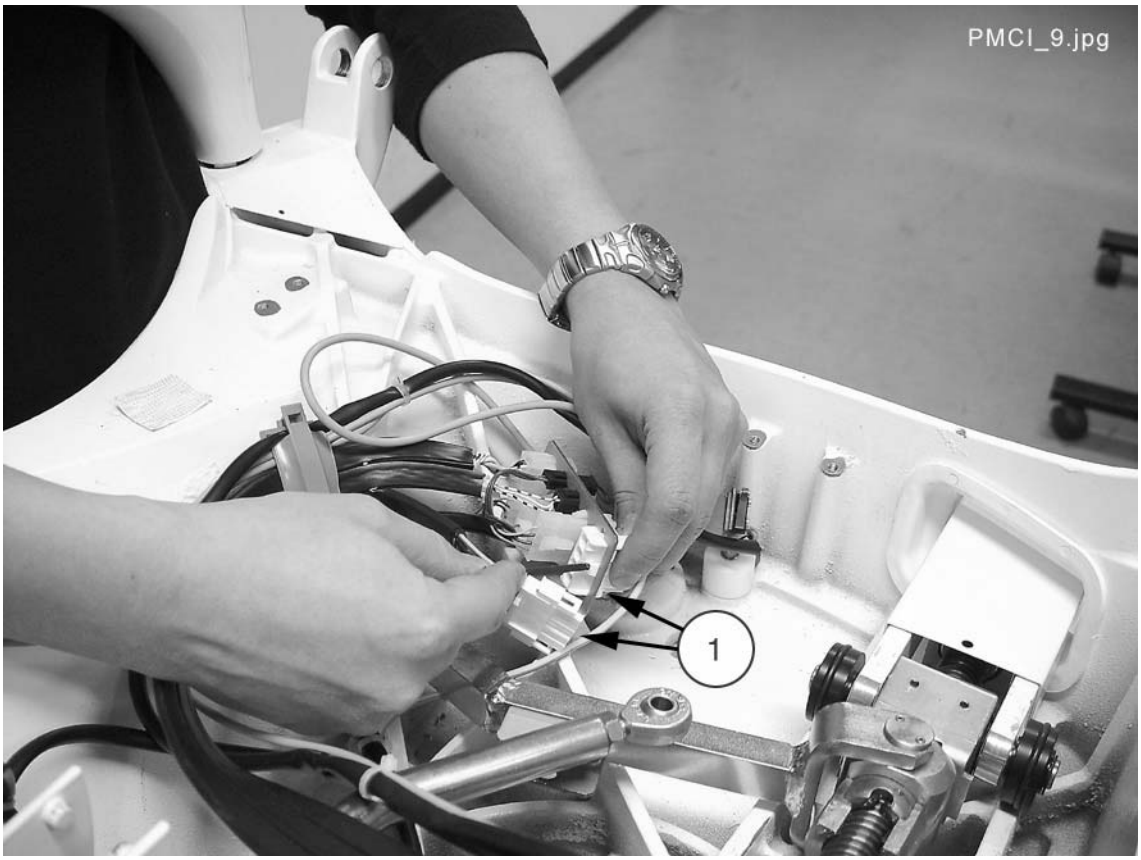
f) Detach the spindle fork assembly from the seat casting by unscrewing the attachment screw using the 6mm Allen key (1).



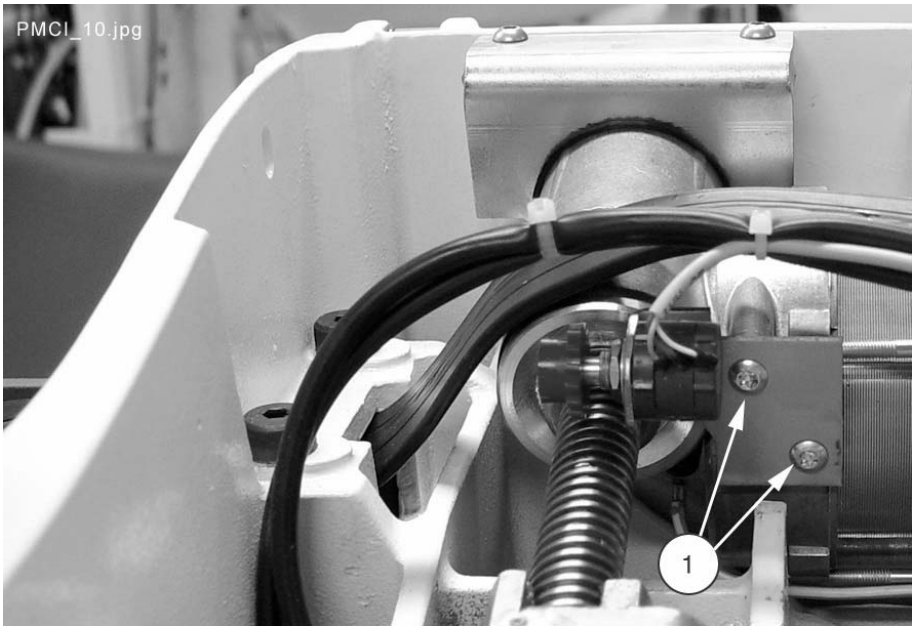
g) Cut the cable tie located on the spindle fork assembly (1) and unscrew the two attachment screws of the backrest emergency microswitch attachment plate using the 3mm Allen key and detach the attachment plate from the backrest motor assembly (2).



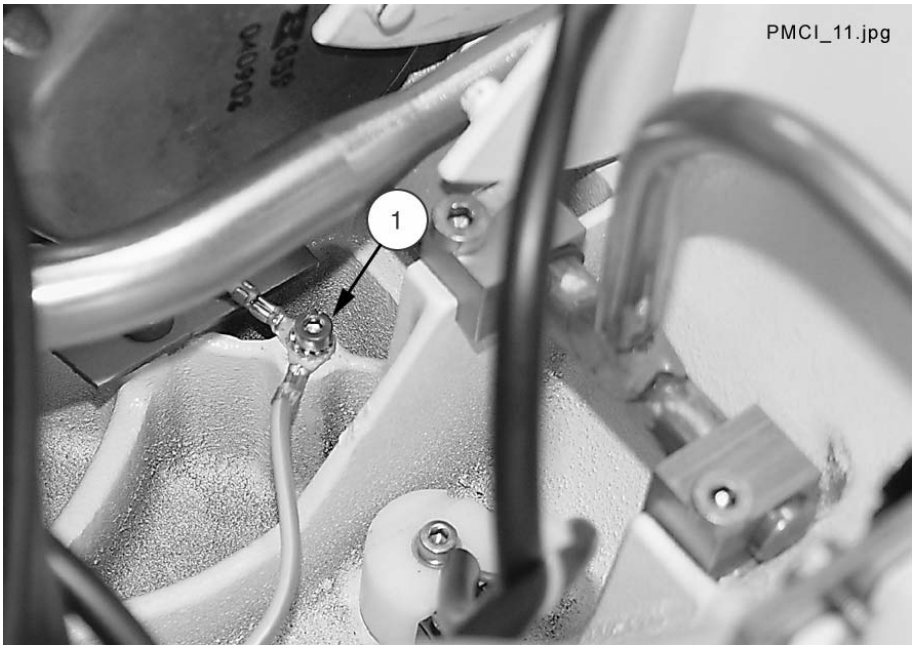
h) Disconnect the Backrest motor cable from the seat cable adapter (1).



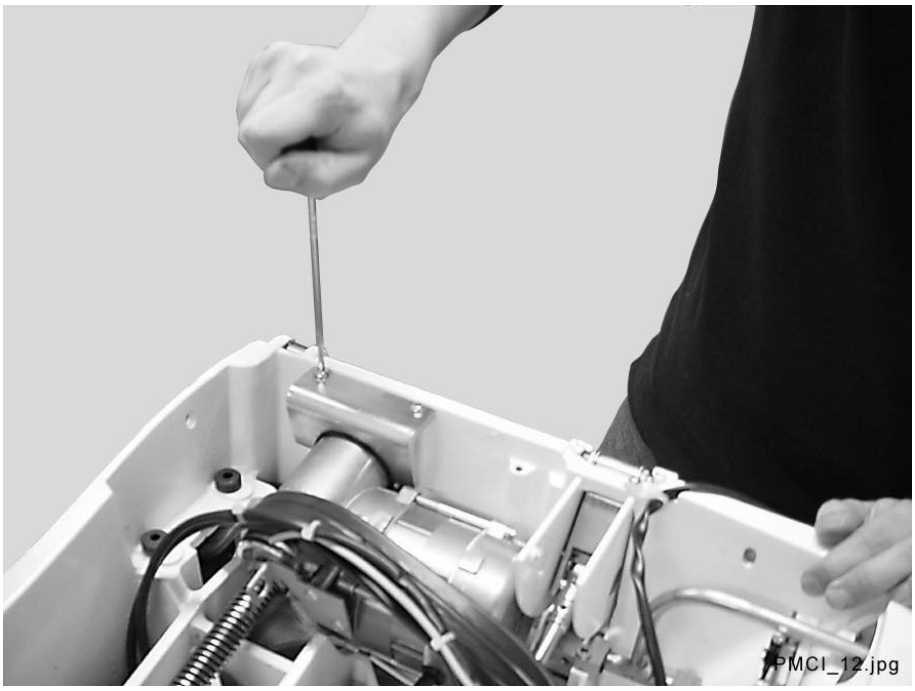
i) Detach the position sensor plate by unscrewing the two Ejot Torx DG 50x10 A2 attachment screws (1).



j) Detach the backrest motor grounding cable (1).



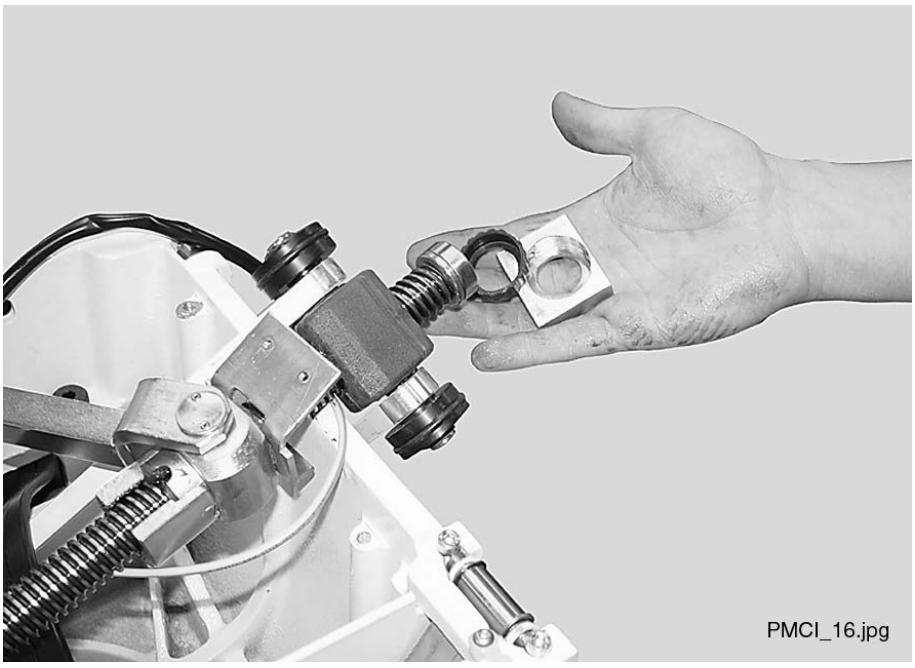
k) Unscrew the two M6x14 ISO 7380 screws at the backrest motor attachment plate using the 4mm Allen key.



l) Detach the backrest motor mechanical limit from the seat casting by unscrewing the M6x16 DIN 7984 attachment screw using 4mm Allen key.

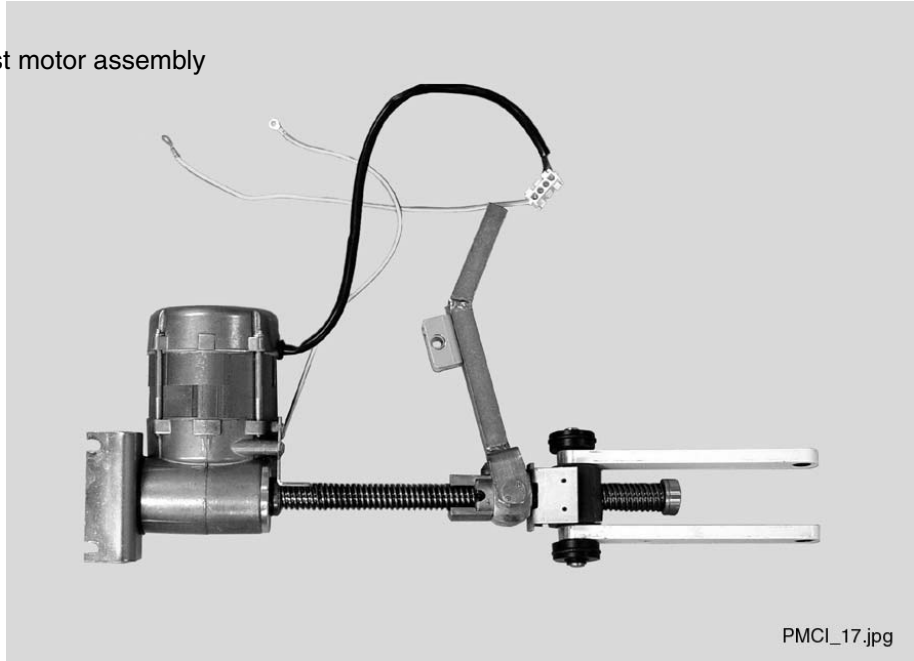
m) Lift the backrest motor from the seat casting.

n) Detach the mechanical limit and bearing from the threaded motor axle.



o) Install the new backrest motor assembly in reverse order. Assemble new cable ties in the place of the ones cut previously.

Backrest motor assembly



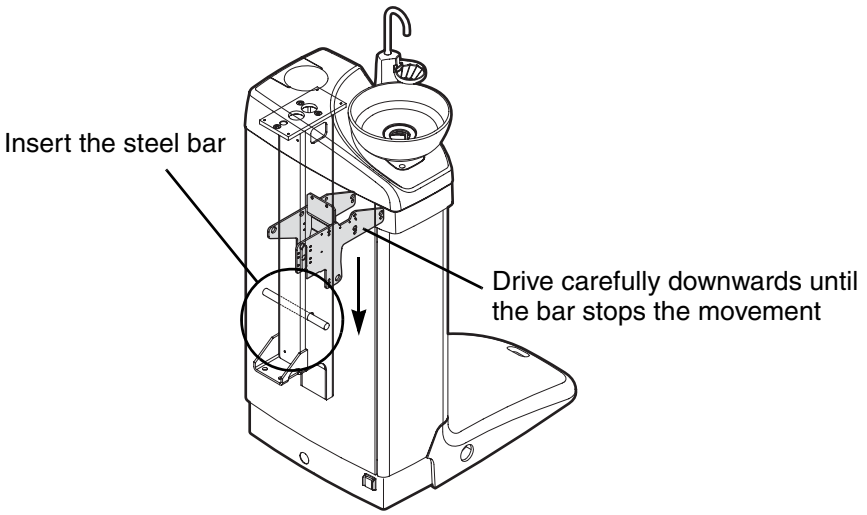
6.2 Replacing chair lift motor

WARNING ⚠

Care must be taken when replacing the chair lift motor. Removing parts of the lifting assembly may enable the patient chair to fall causing a dangerous situation and/or damage to the equipment. The downward movement of the chair must be eliminated before the motor is detached.

a) In the case that the motor is somewhat operational, drive the patient chair upwards until you gain access to the opening on the lifting column. Insert a robust steel bar through the lifting column. Carefully drive the chair downwards until the steel bar supports the lifting adapter (and the chair).

If the motor is completely jammed, position a robust box etc. under the patient chair to eliminate the downward movement of the chair.



NOTE ***Ensure that the steel bar supports the whole weight of the patient chair by trying to pull out the bar. The steel bar must not move.***

b) Remove the separator tank.

c) Lift aside the magnetic valve/pressure regulator assembly.

d) Remove the cuspidor cover.

e) Remove all the necessary cable ties relating to the Lift motor cable or the Lift motor potentiometer cable.

f) Remove the lower cable guide by unscrewing the three M4x8 DIN 912 screws.

g) Remove the cover of the electronics control box.

h) Loosen the four screws that are holding the electronics control box in position and lift the box aside to gain access to the lift motor.

i) Disconnect the Lift motor potentiometer cable from the connector P24 (Lift pot) on the Main control PCB.

j) Disconnect the Lift motor cable from the connector P23 (Lift motor).

k) Unscrew the eight M6x45 DIN 912 screws that hold the nut attachment plate in position.

l) Remove the nut attachment plate and the lifting frames.

m) Remove the ø10 DIN 6799 locking ring from the lift motor attachment axle.

n) Slide the lift motor from the attachment axle and turn it in a way that the Motor grounding cable can be detached. Detach the Motor grounding cable from the side of the motor.

o) Lift the Lift motor from the cuspidor.

p) Unscrew the M10x25 ULS screw from the end of the worm screw and remove the worm screw nut.

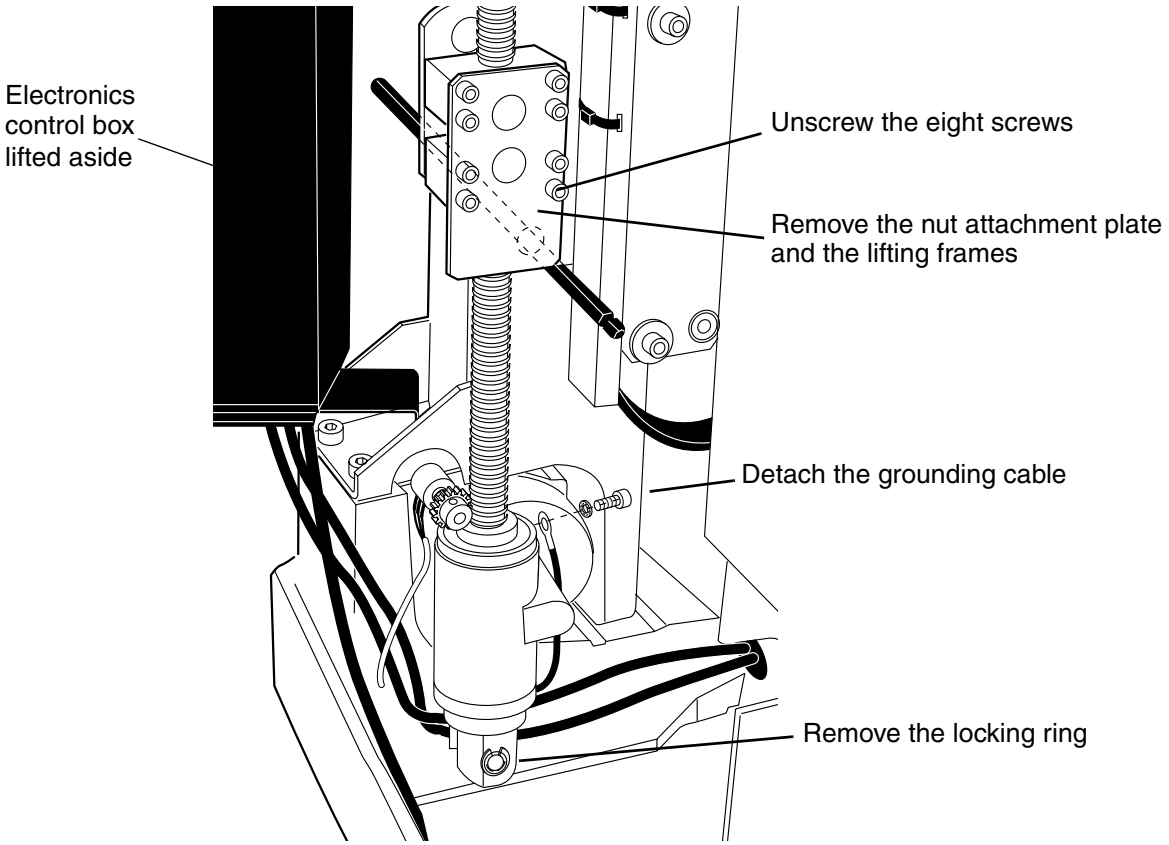
q) Detach the lift motor position sensor by unscrewing the two M5x12 DIN 7500 screws.

r) Grease the new motor's worm screw. Install the new lift motor in reverse order.

NOTE ***Pay attention when reconnecting the lift motor position sensor, refer to section 5.8 "Replacing position sensors" on page G-22.***

NOTE ***Calibrate the lift motor position sensor as described in section 2.2 "Calibrating lift motor position sensor" on page F-20.***

Ensure that the steel bar is supporting the whole weight of the chair!


Electronics control box lifted aside
Unscrew the eight screws
Remove the nut attachment plate and the lifting frames
Detach the grounding cable
Remove the locking ring

7 VALVES & FILTERS REPLACEMENT

7.1 Decompressing water and air pressures

a) Turn off the water supply line.
b) Decompress the water pressure with the syringe instrument.
c) Turn off the air supply line.
d) Decompress the air pressure with the syringe instrument.
e) Turn off the unit.
f) If necessary, loosen the two screws attaching the magnetic valve assembly to the cuspidor support plate and remove the assembly to get more space to replace the valves.

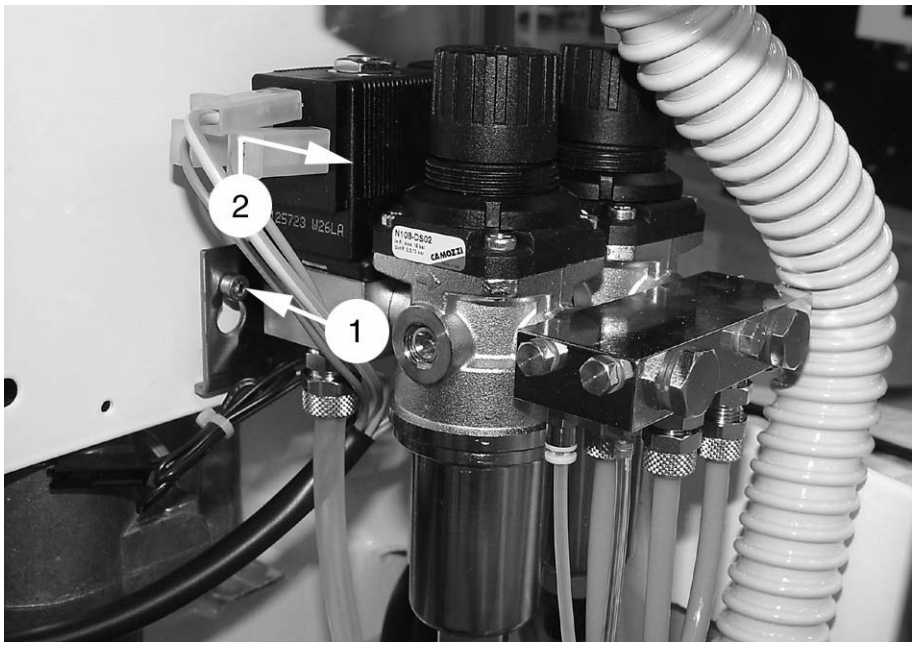
7.2 Replacing the whole magnetic valve/pressure regulator assembly

WARNING ⚠

Special care must be taken when disconnecting the water and air inlet tubes. Ensure that the water and air supply lines are turned off.

NOTE ***Any splashed water must be carefully removed prior to unit turn-on.***

a) Decompress the water and air pressures as described in section 7.1 “Decompressing water and air pressures” on page G-32.
b) Loosen the two attachment screws (1) and lift off the magnetic valve/pressure regulator assembly from the cuspidor plate (2).
c) Disconnect all the magnetic valve control cables that are connected to the valves.
d) Detach all the water and air tubes that are connected to the valves.
e) Install the new magnetic valve/pressure regulator assembly in reverse order.
f) Apply pressure to test that there are no air or water leaks.



7.3 Replacing water and air filter/regulator assemblies

CAUTION ***Ensure that the water and air supply lines are turned off.***

a) Decompress the water and air pressures as described in section 7.1 “Decompressing water and air pressures” on page G-32.

b) Loosen the two screws attaching the magnetic valve assembly to the cuspidor plate and lift off the magnetic valve/pressure regulator assembly.

c) If necessary for easier access, disconnect the control cable from the main valve you are working on.

d) Detach the water (N108-DS02) or air (N108-DS01) filter/regulator by unscrewing the two bolts which hold it in position.
If necessary, detach the water or air filter by unscrewing it from the water or air regulator.

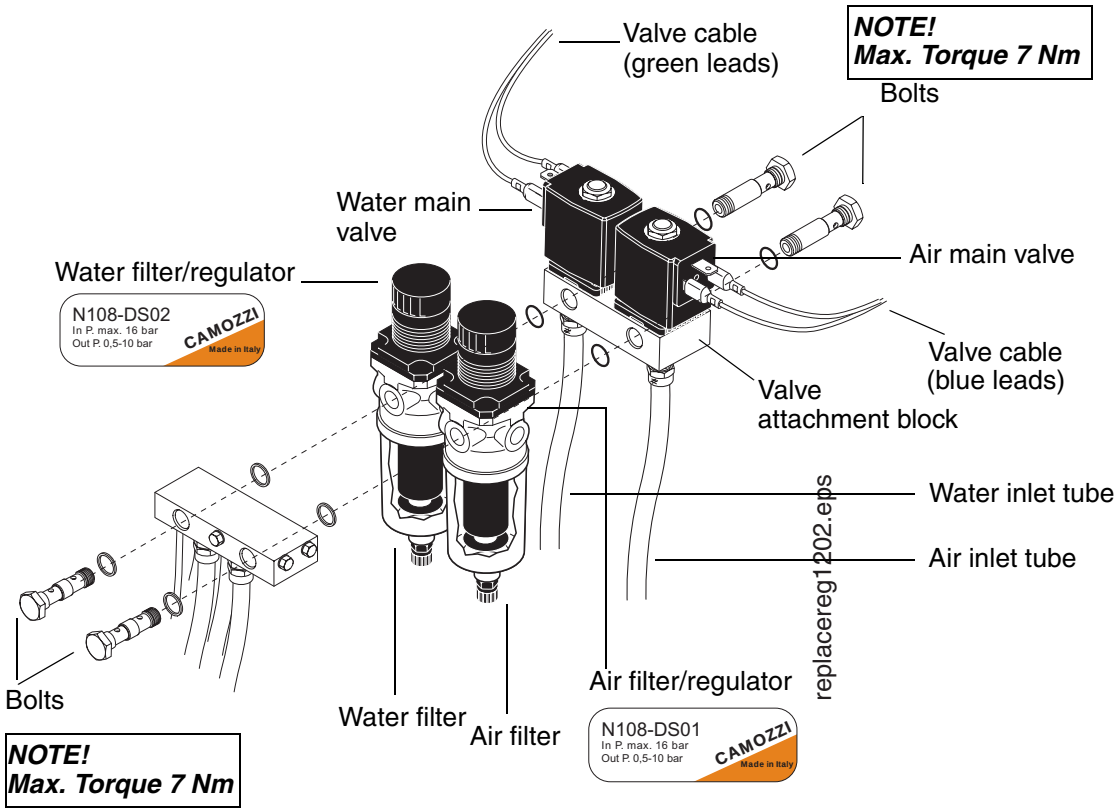
e) Install the new filter/regulator into position in reverse order.

NOTE ***Be careful not to overtighten the bolts. (Max. Torque 7 Nm)***

f) Adjust the pressure regulator as described in section 3.1 “Adjusting internal water & air pressures” on page F-23:

- water 280 kPa (2.8 bar) (41 psi)
- air 550 kPa (5.5 bar) (80 psi)

g) Apply pressure to test that there are no air or water leaks.

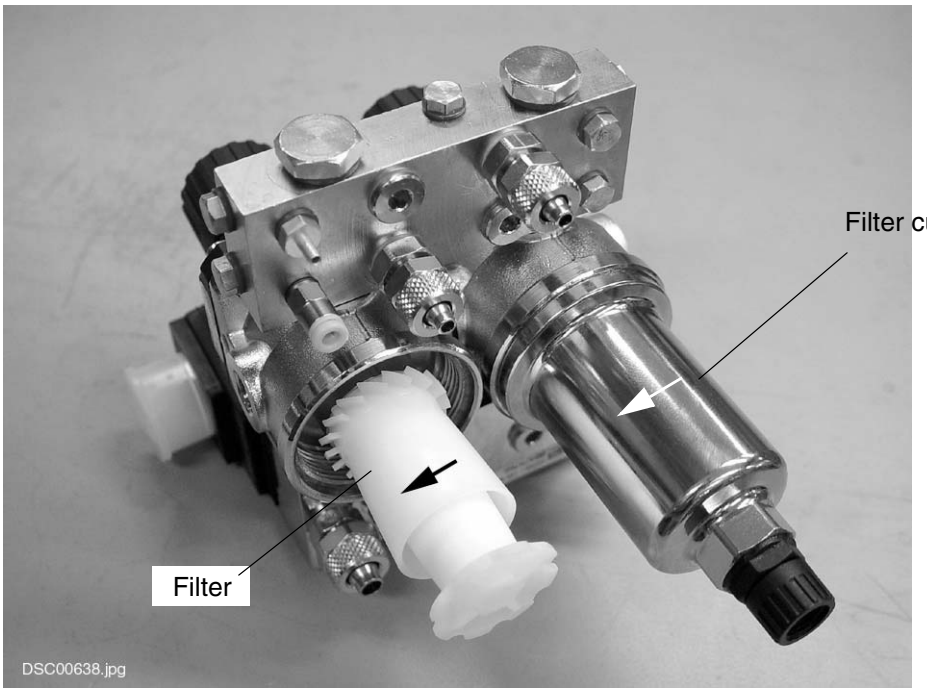


7.4 Replacing water and air filters and the water regulator plug

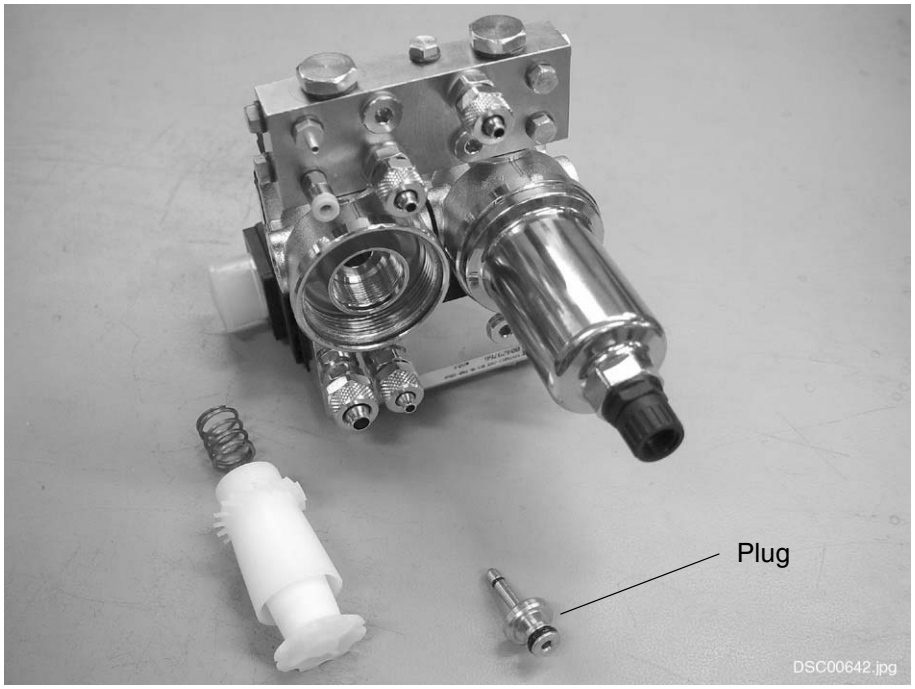
a) Decompress the water and air pressures as described in section 7.1 “Decompressing water and air pressures” on page G-32.

b) Open the filter cup. Use the 17mm fork spanner if needed.

c) Remove the filter by unscrewing it from the regulator.



d) **Water regulator: replacing the plug**
If needed, the plug can be replaced after the water filter is removed. Pull the plug away from the regulator. Lubricate the new plug with non-toxic vaseline and place it to the regulator.



e) Attach the new filter to its position and attach the filter cup. Be careful not to overtighten the filter cup, you should be able to open it manually.

f) Adjust the pressure regulator as described in section 3.1 “Adjusting internal water & air pressures” on page F-23:
   - water 280 kPa (2.8 bar) (41 psi)
   - air 550 kPa (5.5 bar) (80 psi)

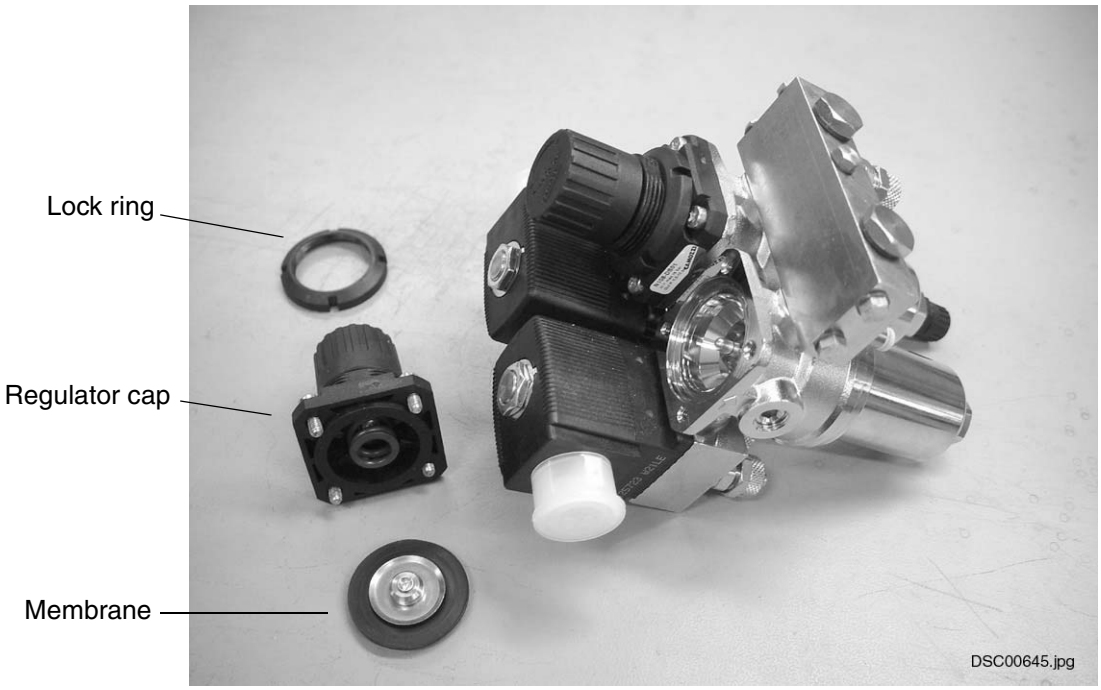
g) Apply pressure to test that there are no air or water leaks.

7.5 Replacing the water / air regulator membrane

a) Remove the lock ring from the regulator cap.

b) Unscrew the four attachment screws of the regulator cap and remove the cap.

c) Replace the membrane. Note, that the air regulator membrane has a small opening in the middle of the membrane.



7.6 Replacing water or air main valve assembly

CAUTION Ensure that the water and air supply lines are turned off.

a) Decompress the water and air pressures as described in section 7.1 “Decompressing water and air pressures” on page G-32.

b) Disconnect the control cable from the main valve you are working on.

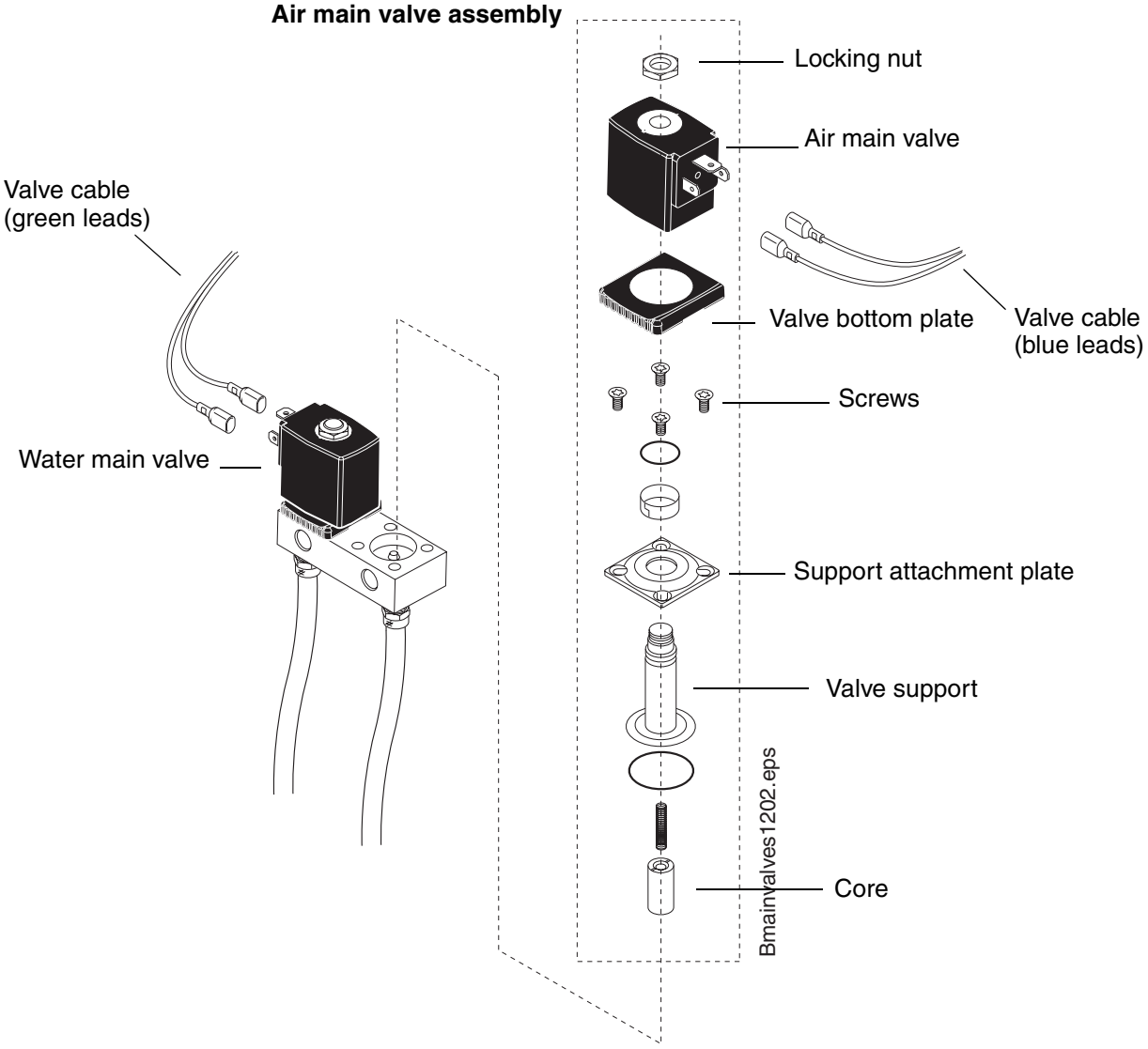
c) Detach the locking nut from the main valve. Remove the old main valve. Detach the valve bottom plate.

d) Remove the valve support and its attachment plate by unscrewing the four screws. Remove the O-ring, spring and core.

e) Install the new main valve assembly in reverse order.

f) Check that the valve functions correctly.

Air main valve assembly



8 CABLES & TUBES REPLACEMENT

8.1 Replacing OP delivery arm cable

NOTE ***Be careful not to break the bowl collar when you replace the console arm cable.***

a) Release the tension of the gas spring (i.e. decrease the tension as much as possible) as described in section 1.3 “Adjusting balance of the OP delivery arm” on page F-3.

b) Detach the instrument console from the console arm as described in section 9.1 “Detaching the instrument console from the OP delivery arm” on page G-38.

c) Detach the console arm from the cuspidor as described in section 9.3 “Replacing the whole OP delivery arm” on page G-40.

d) Slide the arm joint cover from over the console arm joint.

e) Attach a draw cord to the cuspidor end of the console arm cable.

f) Pull the console arm cable from the console arm joint in a way that the draw cord is pulled inside the rotating arm.

g) Continue pulling the console arm cable from the instrument console end of the console arm.

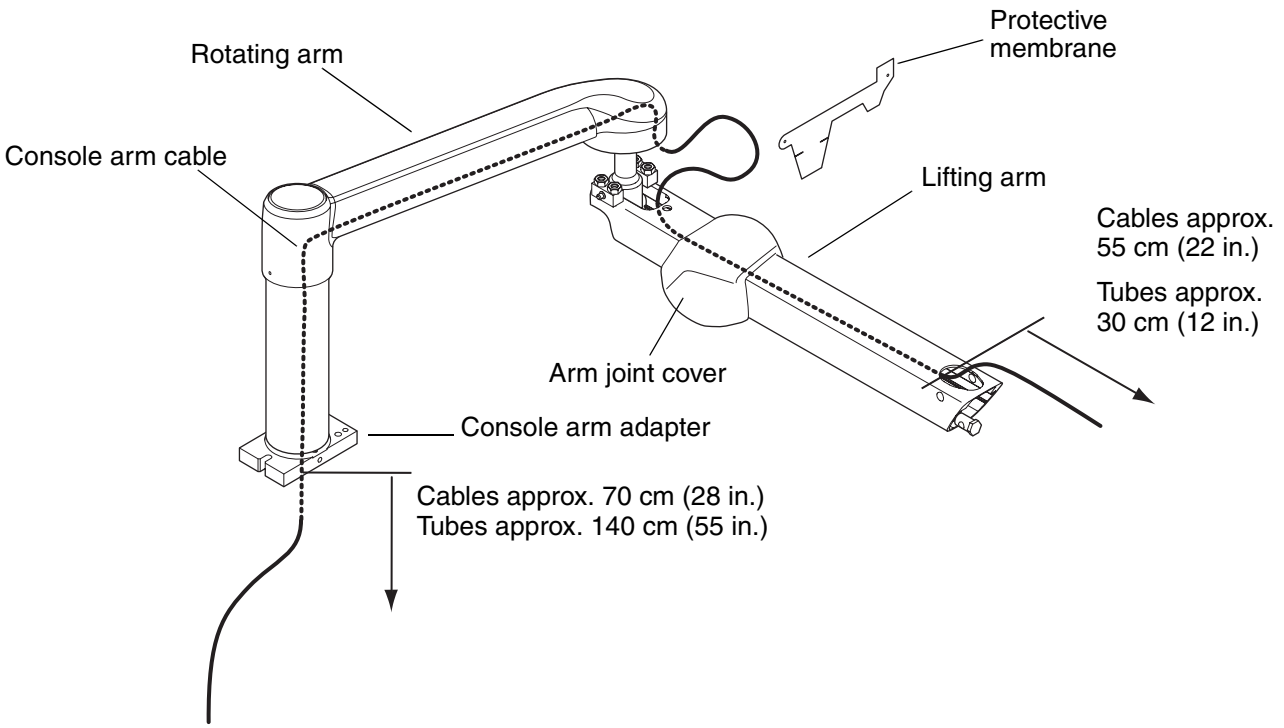
h) Pull the new console arm cable to inside the console arm using the draw cord according to the dimensions given below. Ensure that the cable is not stretched or rubbed by the arm castings in any position of the arm.

i) Assemble the protective membrane carefully around the console arm joint.

j) Assemble and attach the console arm in reverse order.

k) Adjust the balance of the console arm as described in section 1.3 “Adjusting balance of the OP delivery arm” on page F-3.

l) If necessary, adjust the angle of the instrument console as described in section 1.4 “Adjusting angle of the OP delivery arm instrument console” on page F-9.



9 OTHER PARTS REPLACEMENT

9.1 Detaching the instrument console from the OP delivery arm

a) Remove all the instrument hoses and the instrument arms from the instrument console.

b) Disconnect the cables and tubes of the console arm cable from the instrument multiplexer as described in section 3.2 “Replacing the whole multiplexer” on page G-6.

c) Remove the friction adjuster by unscrewing the two M5x20 DIN 912 and the M6x16 DIN 916 screws and lift off the whole instrument console.

d) Remove the bearing assembly from the lower joint axle.

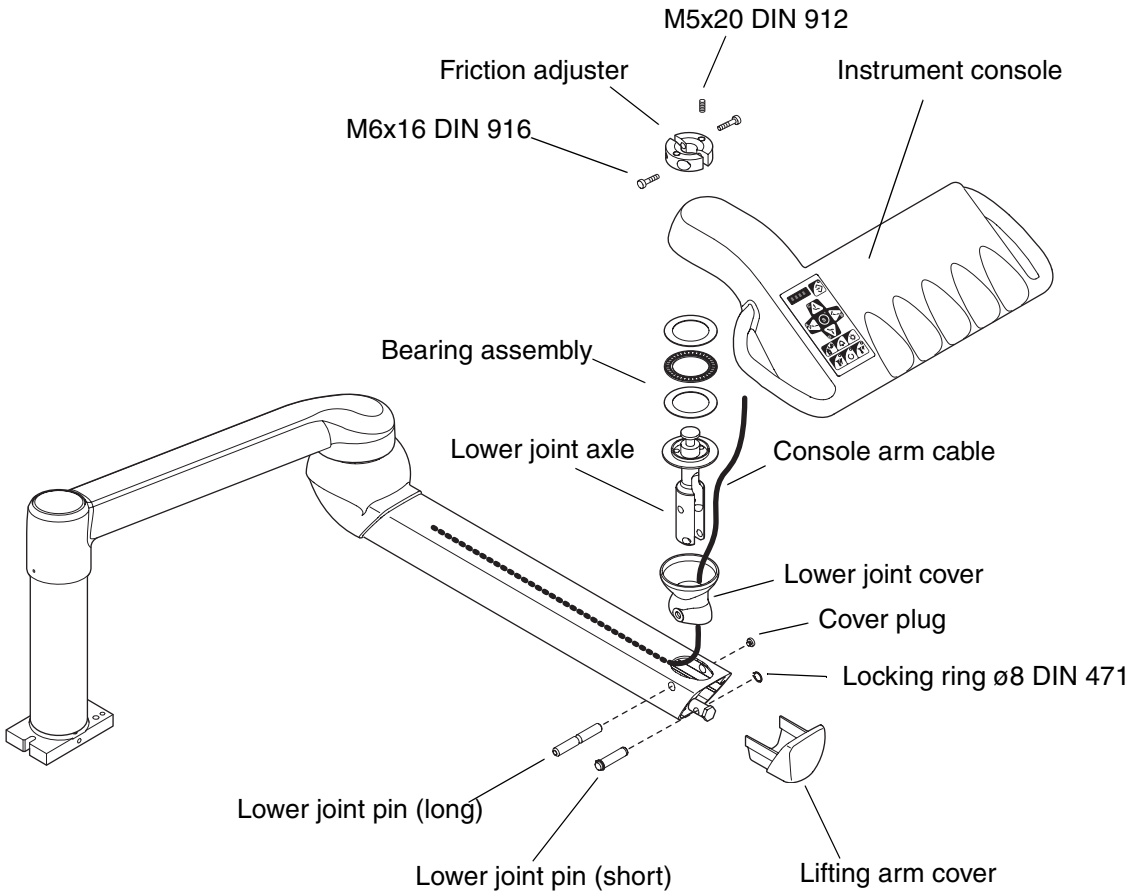
e) Remove the lifting arm cover.

f) Detach the ø8 DIN 471 locking ring and tap off the lower joint pin (short) with a hammer.

g) Remove the cover plug and tap off the lower joint pin (long).

h) Lift off the lower joint axle and the lower joint cover.

i) Attach the instrument console to the console arm in reverse order.



9.2 Replacing OP delivery arm gas spring

NOTE ***Please note that the console arm cable need not to be removed during this operation.***

a) Release the tension of the gas spring (i.e. decrease the tension as much as possible) as described in section 1.3 “Adjusting balance of the OP delivery arm” on page F-3.

b) Remove the instrument console and the lower joint axle as described in section 9.1 “Detaching the instrument console from the OP delivery arm” on page G-38.

c) Slide the arm joint cover from over the upper joint.

d) Unscrew the two M5x8 DIN 7991 screws from under the lifting arm.

e) Lift the console arm to its upmost position. Remove the ø10 DIN 6799 securing ring from the upper joint pin and tap off the upper joint pin from the upper joint axle.

f) Remove the whole lifting arm assembly from inside the lifting arm.

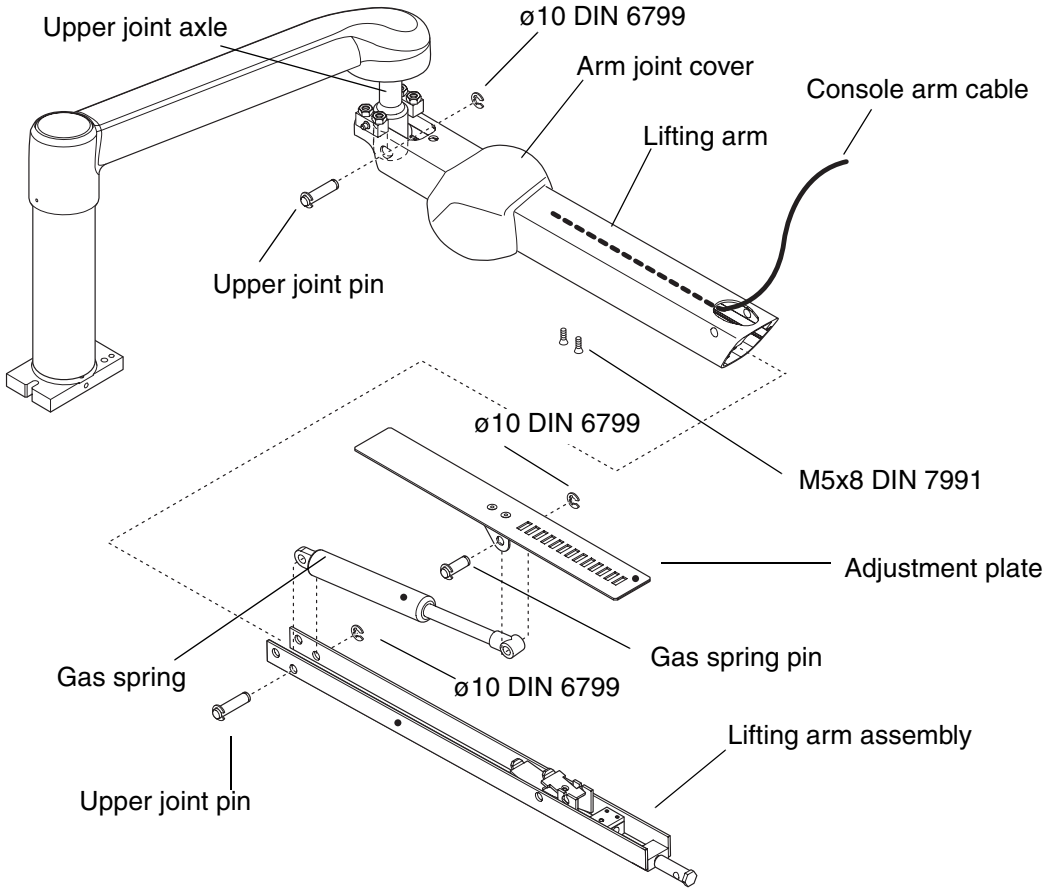
g) Remove ø10 DIN 6799 securing ring from the gas spring pin and remove the gas spring pin.

h) Remove the ø10 DIN 6799 securing ring from the upper joint pin at the other end of the gas spring and remove the upper joint pin.

i) Install the new gas spring in reverse order.

j) Adjust the balance of the instrument console as described in section 1.4 “Adjusting angle of the OP delivery arm instrument console” on page F-9.

k) Adjust the balance of the console arm as described in section 1.3 “Adjusting balance of the OP delivery arm” on page F-3.



9.3 Replacing the whole OP delivery arm

NOTE ***Be careful not to break the bowl collar when you replace the console arm.***

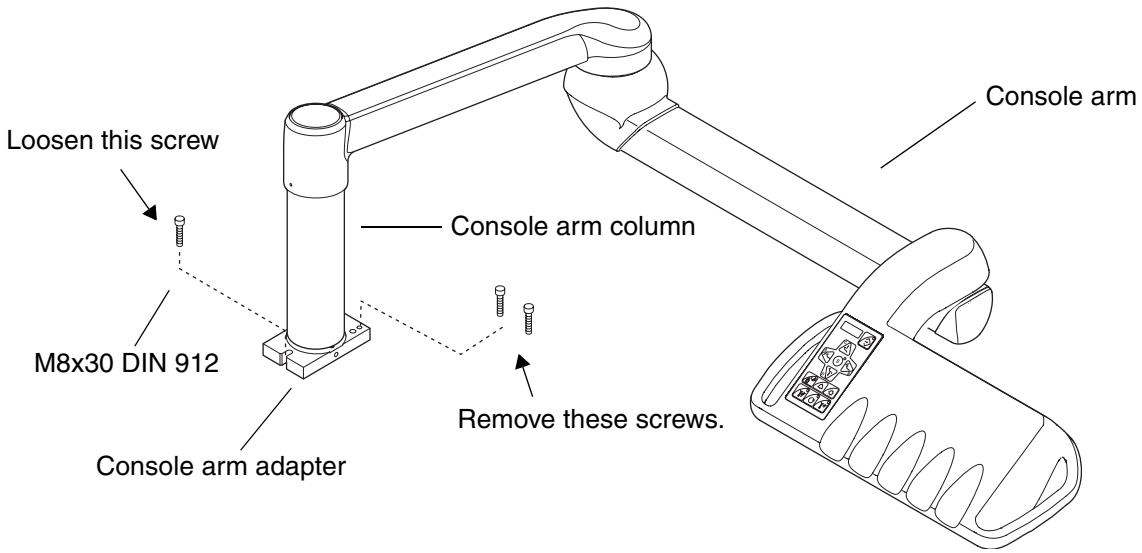
a) In the case that the dental light / Planmeca Intra / monitor is (are) installed to the console arm, disconnect the cables from the main control PCB and remove the equipment with posts from the delivery arm.

b) Disconnect the cables and tubes of the console arm from inside the cuspidor.

c) Rotate the console arm to over the patient chair. Unscrew two of the M8x30 DIN 912 screws that attach the console arm to the cuspidor. Loosen the M8x30 DIN 912 screw inside the groove of the console arm adapter plate. Lift off the console arm (see section “8.1 Attaching the OP delivery arm to the cuspidor” of the Installation manual).

d) Install the new console arm in reverse order.

e) Adjust the vertical position of the console arm column as described in section 1.1 “Adjusting vertical position of the OP delivery arm column” on page F-1.



Chapter

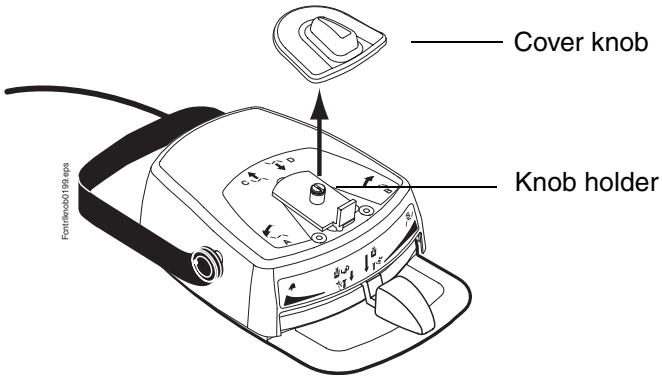
H

FOOT CONTROL

1 PARTS REPLACEMENT & REPAIR

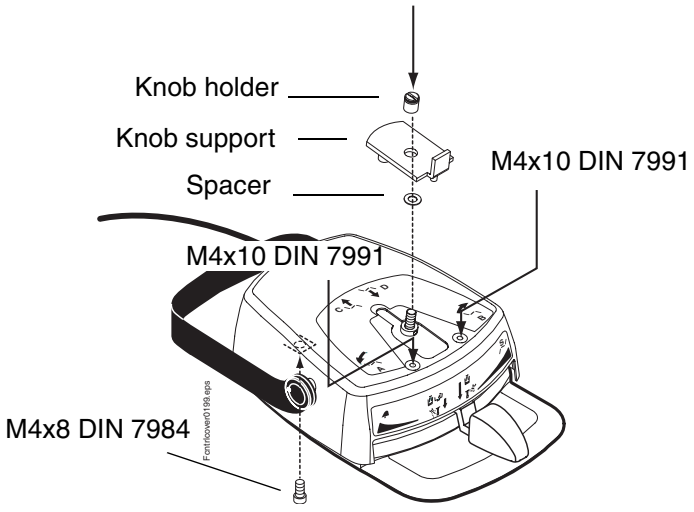
1.1 Removing foot control cover

a) Detach the chair control cover knob.

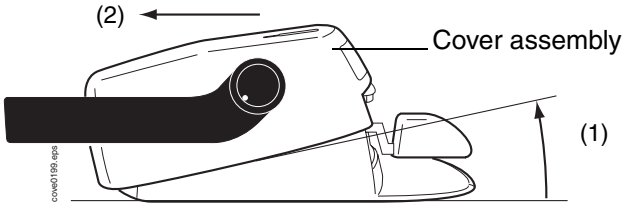


b) Unscrew the knob holder with a screwdriver and remove the knob support. Be careful not to lose the spacer located on the underside of the knob support.

c) Unscrew the M4x8 DIN 7984 screw from under the foot control and the two M4x10 DIN 7991 screws from the top.



d) Remove the cover assembly by first lifting it upwards at the front and then sliding it backwards as shown below.



e) Reassemble in reverse order.

1.2 Replacing chair control springs

a) Remove the foot control cover as described in section “Removing foot control cover” on page H-1.

b) Unscrew the two M4x10 DIN 7991 screws and lift off the chair control assembly.

c) Unscrew the four M4x8 ULS screws and remove the spring support plate.

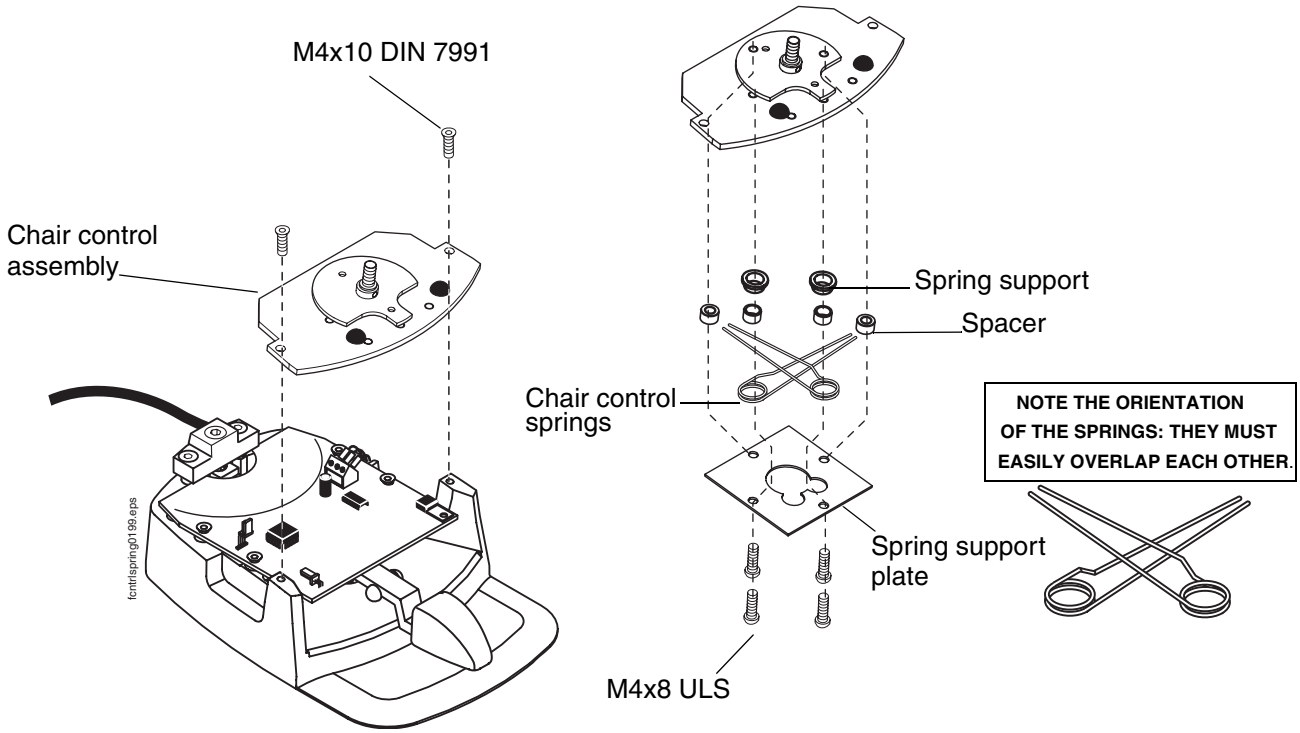
d) Replace the damaged chair control springs with new ones.

NOTE ***Always replace both springs.***

NOTE ***The angle between the spring legs must be closing. If not, bend the spring legs slightly towards each other.***

NOTE ***The springs must be positioned in a way, that they can easily overlap each other (one bends upwards, the other bends downwards).***

e) Reassemble in reverse order.



1.3 Replacing foot control PCB

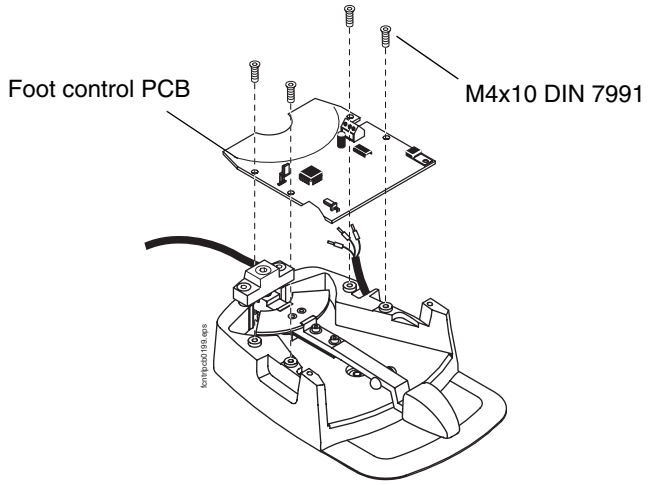
a) Remove the foot control cover as described in section “Removing foot control cover” on page H-1.

b) Remove the chair control assembly as described in section “Replacing chair control springs” on page H-2.

c) Detach the foot control cable from the connector P1 on the foot control PCB.

d) Unscrew the four M4x10 DIN 7991 screws and remove the foot control PCB.

e) Install the new foot control PCB in reverse order.



1.4 Replacing foot control cable

a) Disconnect the foot control cable from the cuspidor by pushing the cable locker and pulling out the cable.

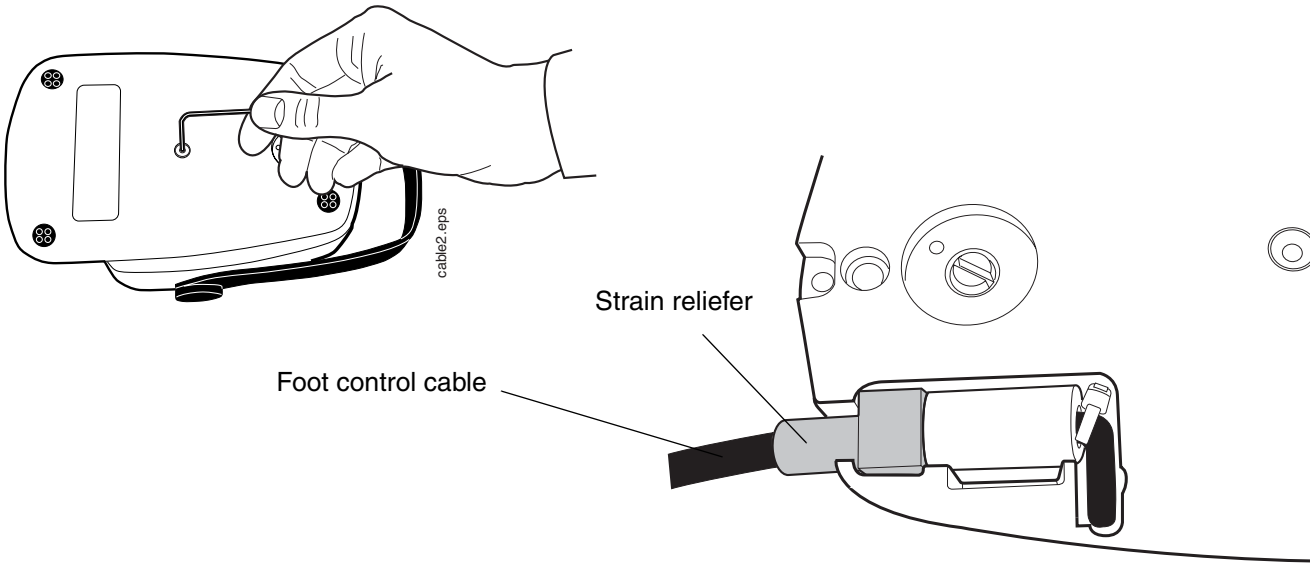
b) Remove the foot control cover as described in section “Removing foot control cover” on page H-1.

c) Remove the bottom plate by unscrewing the center screw as shown.

d) Detach the foot control cable from the connector P1 on the foot control PCB.

e) Lift the strain reliefer upwards and pull the foot control cable out.

f) Install the new foot control cable in reverse order.



1.5 Replacing the pedal assembly (new foot control model, from serial number 826740)

a) Remove the foot control cover as described in section “Removing foot control cover” on page H-1.

b) Remove the chair control assembly as described in section “Replacing chair control springs” on page H-2.

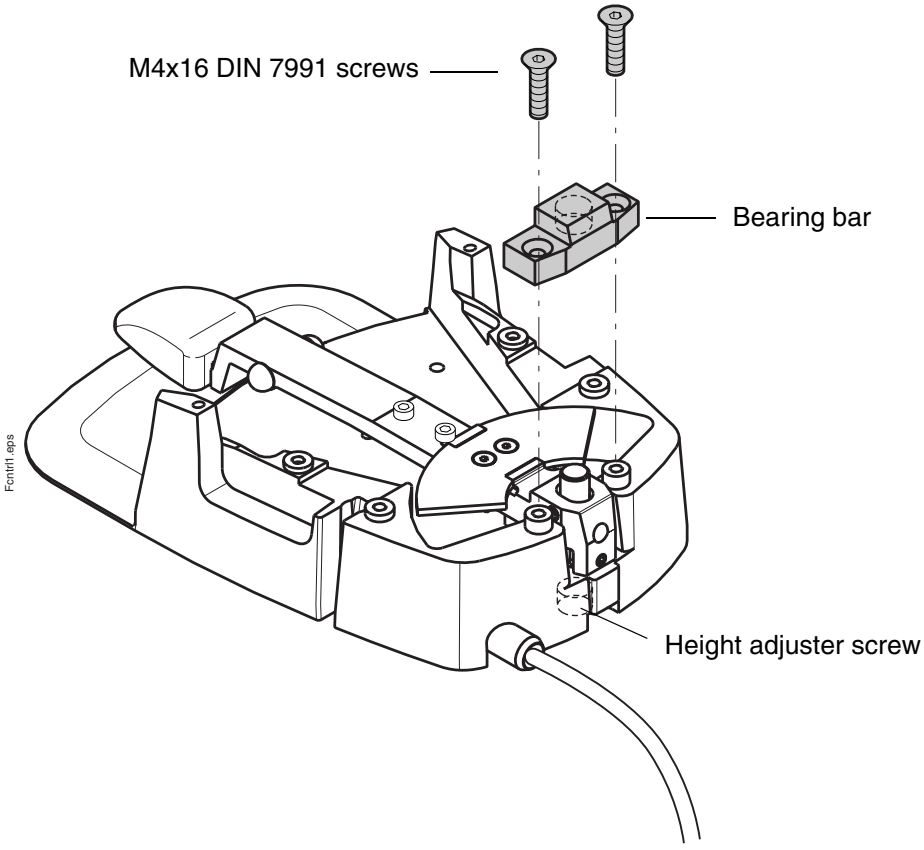
c) Detach the foot control cable from the connector P1 on the foot control PCB.

d) Unscrew the four M4x10 DIN 7991 screws and remove the foot control PCB.

e) Unscrew the two M4x16 DIN 7991 screws that hold the bearing bar in position and remove the bearing bar and the spring washer.

f) Remove the pedal assembly. (If necessary, screw in the pedal height adjuster screw on the underside of the foot control, then lift the pedal assembly off the foot control.)

g) Remount the pedal assembly. Place the bearing bar to its position and secure it with the two M4x16 DIN 7991 screws.



h) Eliminate the horizontal pedal play as described in section “Eliminating sideways play of the foot control pedal” on page H-8.

i) Adjust the pedal tension as described in section “Adjusting tension and angle of the foot control pedal” on page H-9.

j) Calibrate the sector plate and adjust the pedal height as described in section “Calibrating the sector plate and adjusting the angle of the foot control pedal (new foot control model, from serial number 826740)” on page H-11.

k) Put the foot control PCB back in position and secure it with the four M4x10 DIN 7991 screws. Connect the foot control cable to the connector P1.

l) Secure the chair control assembly with the M4x10 DIN 7991 screws and remount the foot control cover.

1.6 Replacing pedal centering spring

a) Remove the foot control cover as described in section “Removing foot control cover” on page H-1.

b) Remove the chair control assembly as described in section “Replacing chair control springs” on page H-2.

c) Detach the foot control cable from the connector P1 on the foot control PCB.

d) Unscrew the four M4x10 DIN 7991 screws and remove the foot control PCB.

e) Unscrew the two M4x16 DIN 7991 screws that hold the bearing bar in position and remove the bearing bar and the spring washer.

f) Remove the pedal assembly. (If necessary, screw in the pedal height adjuster screw on the underside of the foot control, then lift the pedal assembly off the foot control.)

g) Loosen the angle adjusting screw and the tension adjusting screw.

h) Remove the pedal centering spring from the pedal axle.

i) Put the new pedal centering spring and the new spring support on the pedal axle. The ends of the new pedal centering spring should go through the slots in the side wings of the pedal centering plate.

j) Remount the pedal assembly by lightly tapping the pedal axle with a hammer and securing it with the two M4x16 DIN 7991 screws. Make sure that you position the spring washer the right way around with the convex side facing downwards.

k) Center the pedal, calibrate the sector plate and adjust the pedal height as described in section “Calibrating the sector plate and adjusting the angle of the foot control pedal (new foot control model, from serial number 826740)” on page H-11.

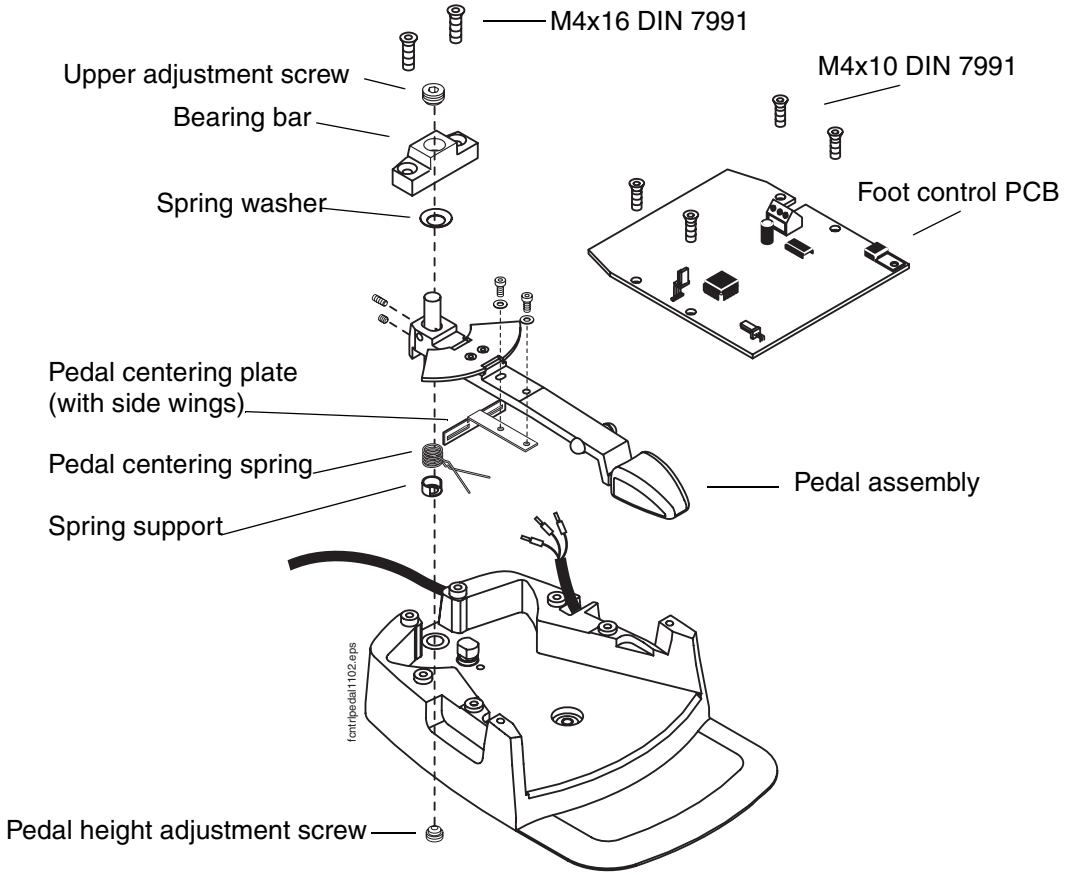
l) Eliminate the horizontal pedal play as described in section “Eliminating sideways play of the foot control pedal” on page H-8.

m) Put the foot control PCB back in position and secure it with the four M4x10 DIN 7991 screws. Connect the foot control cable to the connector P1.

n) Adjust the pedal tension and angle as described in section “Adjusting tension and angle of the foot control pedal” on page H-9.

o) Secure the chair control assembly with the M4x10 DIN 7991 screws and remount the foot control cover.

p) Calibrate the foot control as described in section “Calibrating foot control” on page H-15.



2 ADJUSTMENTS

2.1 Centering foot control pedal

NOTE ***The pedal of the new foot control model is also centered when the sector plate is calibrated, see section "Calibrating the sector plate and adjusting the angle of the foot control pedal (new foot control model, from serial number 826740)" on page H-11.***

a) Remove the foot control cover as described in section "Removing foot control cover" on page H-1.

b) Remove the foot control PCB as described in section "Replacing foot control PCB" on page H-3.

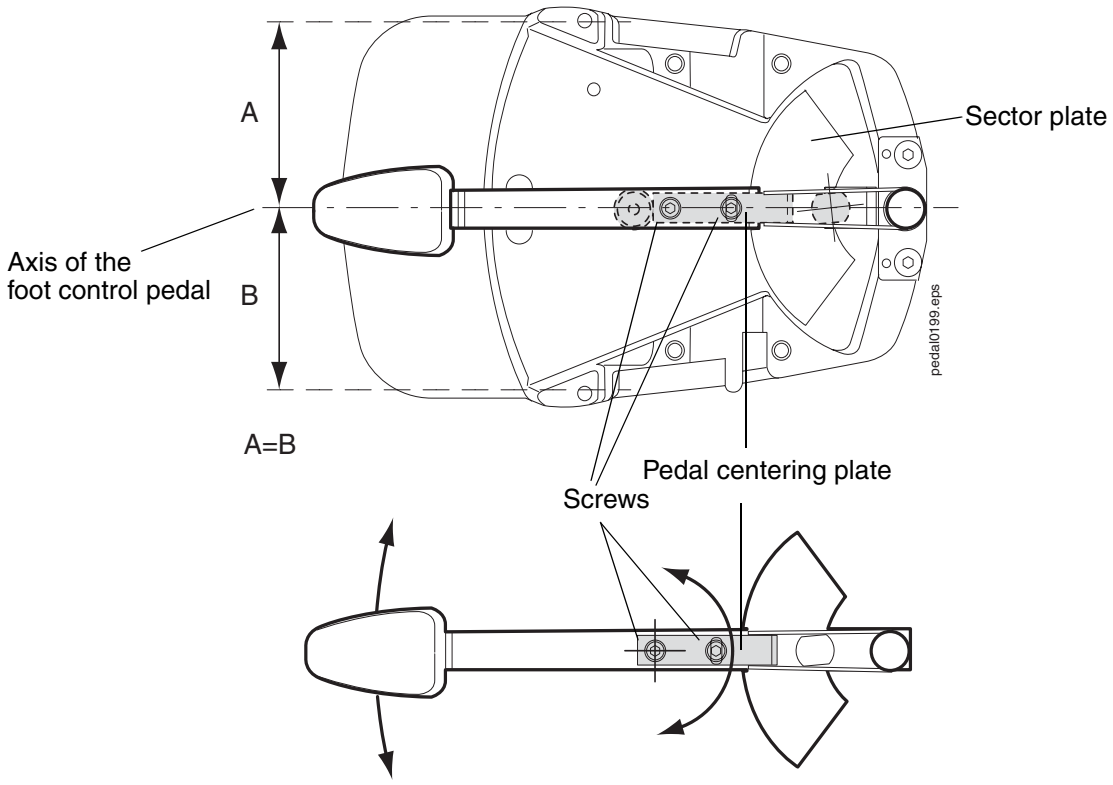
c) Loosen the two screws which hold the pedal centering plate in position.

d) By adjusting the position of the pedal centering plate, center the foot control pedal so that it is positioned exactly in the middle of the foot control casting (A=B).

e) Tighten the two pedal centering plate screws.

f) Reassemble the foot control in reverse order.

g) Calibrate the foot control as described in section "Calibrating foot control" on page H-15.

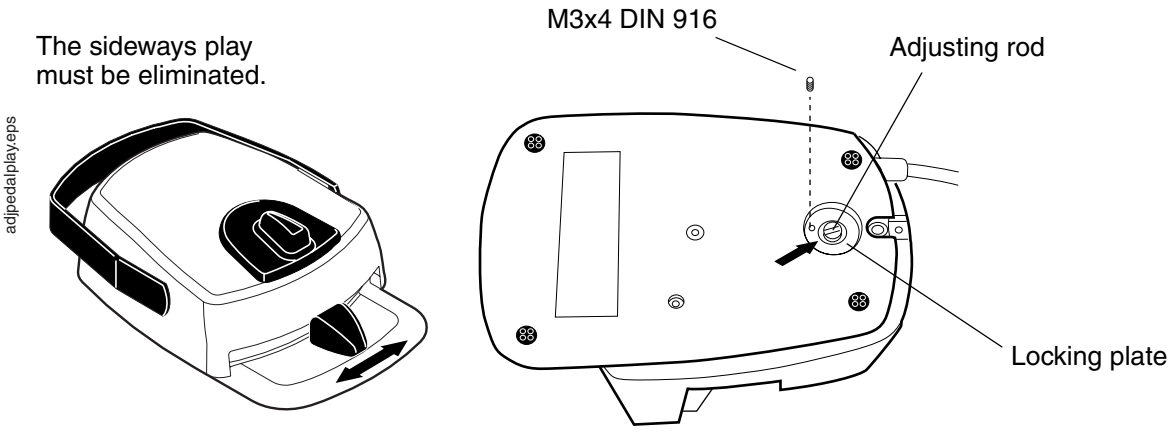


2.2 Eliminating sideways play of the foot control pedal

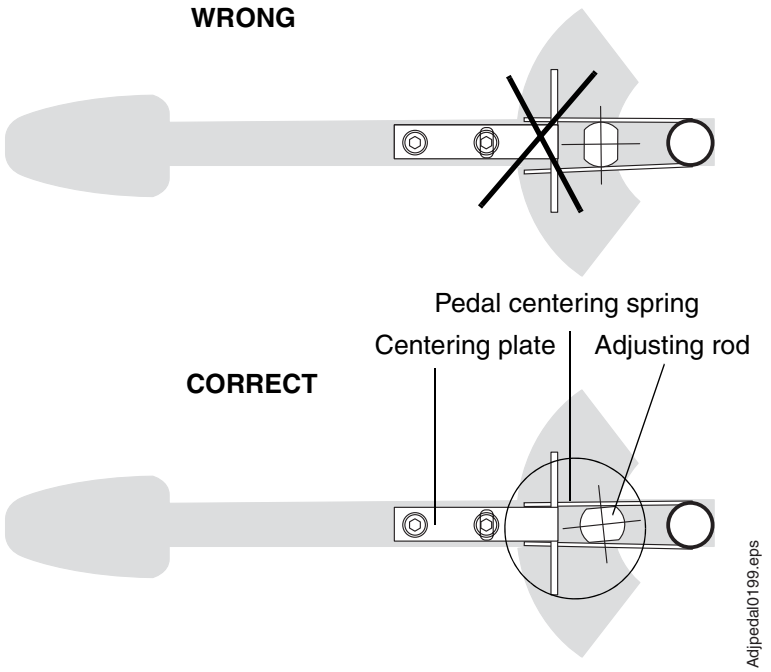
a) Remove the foot control cover as described in section “Removing foot control cover” on page H-1.

b) Remove the foot control PCB as described in section “Replacing foot control PCB” on page H-3.

c) Loosen the M3x4 DIN 916 locking screw on the underside of the foot control and loosen the locking plate half a turn.



d) Eliminate the horizontal play of the pedal by slightly turning the adjusting rod. When making the adjustment, ensure that the pedal centering spring touches the adjusting rod and the centering plate on both sides as shown below.



e) Tighten the locking plate but make sure that the adjusting rod does not move when doing this.

f) Tighten the M3x4 DIN 916 locking screw on the underside of the foot control.

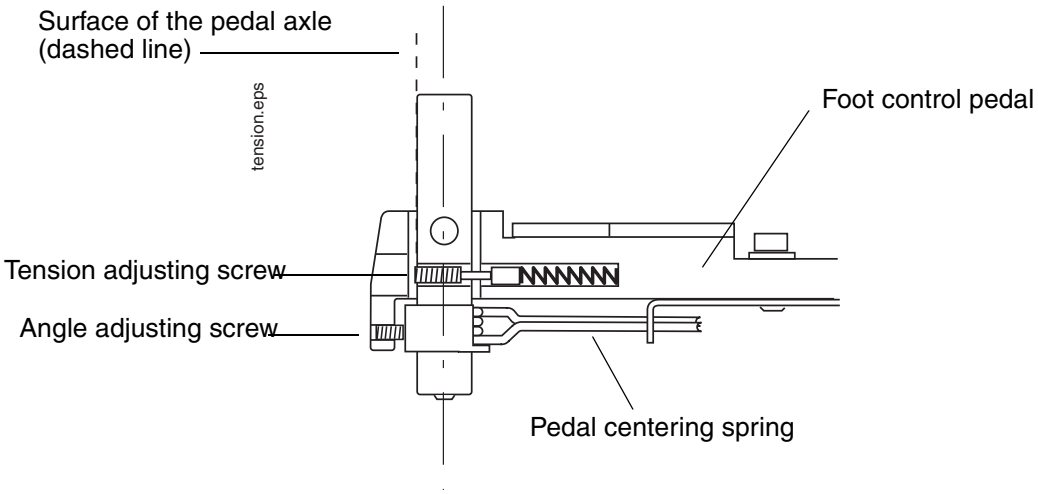
g) Reassemble the foot control in reverse order.

h) Calibrate the foot control as described in section “Calibrating foot control” on page H-15.

2.3 Adjusting tension and angle of the foot control pedal

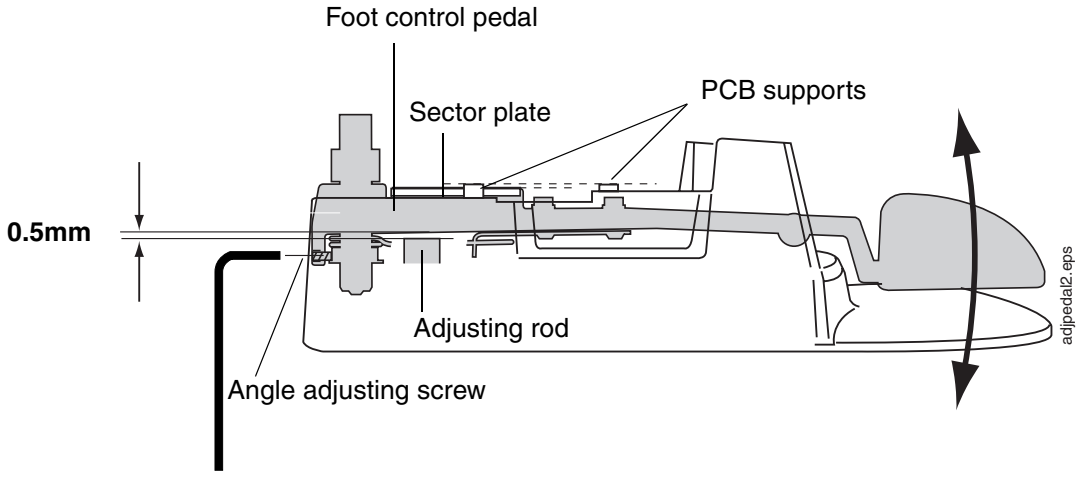
a) Remove the foot control cover as described in section “Removing foot control cover” on page H-1.

b) Adjust the pedal tension by tightening/loosening the tension adjusting screw.
For the recommended adjustment, first tighten the tension adjusting screw so that the screw head is level with the surface of the pedal axle (dashed line), then unscrew it one turn.



c) Judging by eye, adjust the slope of the sector plate so that it is parallel with the four PCB supports by tightening the angle adjusting screw.

d) Adjust the angle of the pedal by tightening/loosening the angle adjusting screw. The front end of the pedal should move 4-5mm vertically (up/down) for convenient use of the foot control. If the pedal is tilted too much, the front end of the pedal’s sector plate could touch the foot control PCB and damage it quickly.
Additionally, check that the adjusting rod does not touch the pedal as you push the pedal down. The clearance between the pedal and the adjusting rod should be approx. 0.5mm when you push the pedal down.



e) Reassemble the foot control in reverse order.

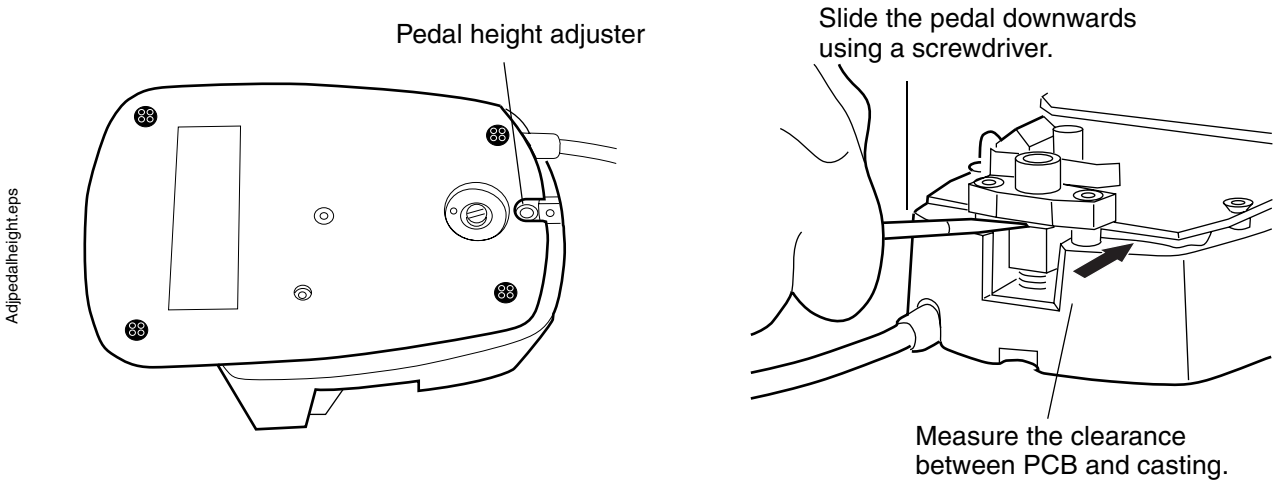
f) Calibrate the foot control as described in section “Calibrating foot control” on page H-15.

2.4 Adjusting height of the foot control pedal (old foot control model, serial number smaller than 826740)

a) Remove the foot control cover as described in section “Removing foot control cover” on page H-1.

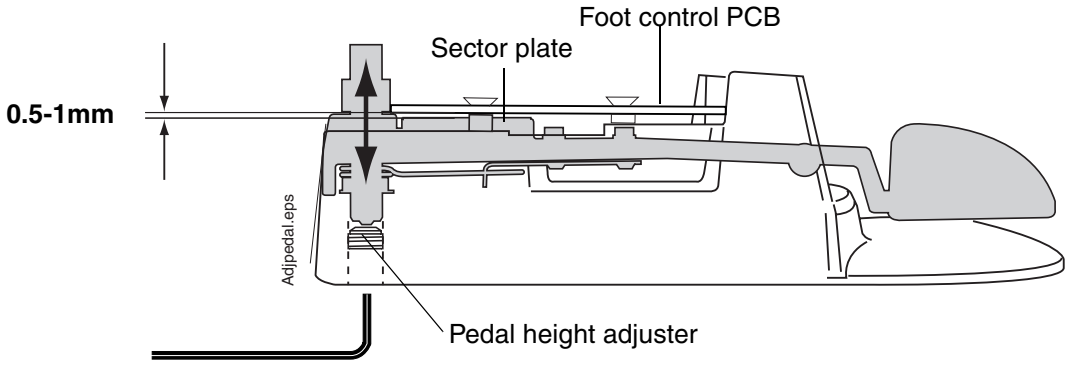
b) Loosen the pedal height adjuster on the underside of the foot control a couple of turns.

c) Insert a screwdriver between the pedal and the bearing bar and slide the pedal downwards along the pedal axle.


Adjpedalheight.eps
Pedal height adjuster
Slide the pedal downwards using a screwdriver.
Measure the clearance between PCB and casting.

d) Apply a drop of Loctite 243 sealer (or corresponding) to the pedal height adjuster. Using a feeler gauge, adjust the clearance between the foot control PCB and the pedal’s sector plate to 0.5 - 1mm by tightening the pedal height adjuster. Do not allow Locktite to get to the pedal axle.

NOTE ***Make sure that the sector plate does not touch the foot control PCB in any pedal position.***
Check also that the pedal does not touch the switch on the underside of the PCB.



e) Reassemble the foot control in reverse order.

f) Calibrate the foot control as described in section “Calibrating foot control” on page H-15.

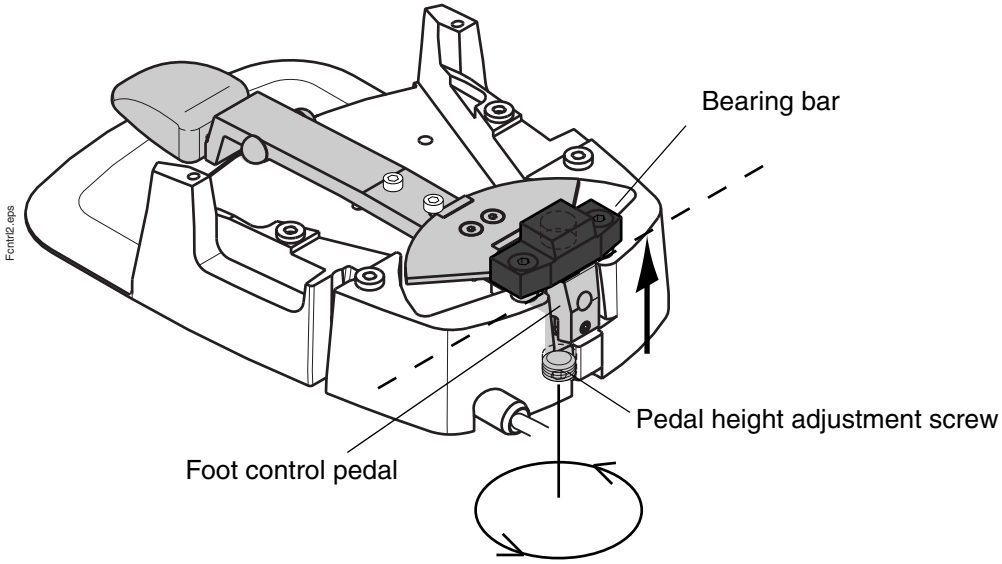
2.5 Calibrating the sector plate and adjusting the angle of the foot control pedal (new foot control model, from serial number 826740)

NOTE ***You will need a foot control calibration tool (Planmeca order code 10007445) to perform the adjustments described in this section. The sector plate calibration cannot be performed without the calibration tool.***

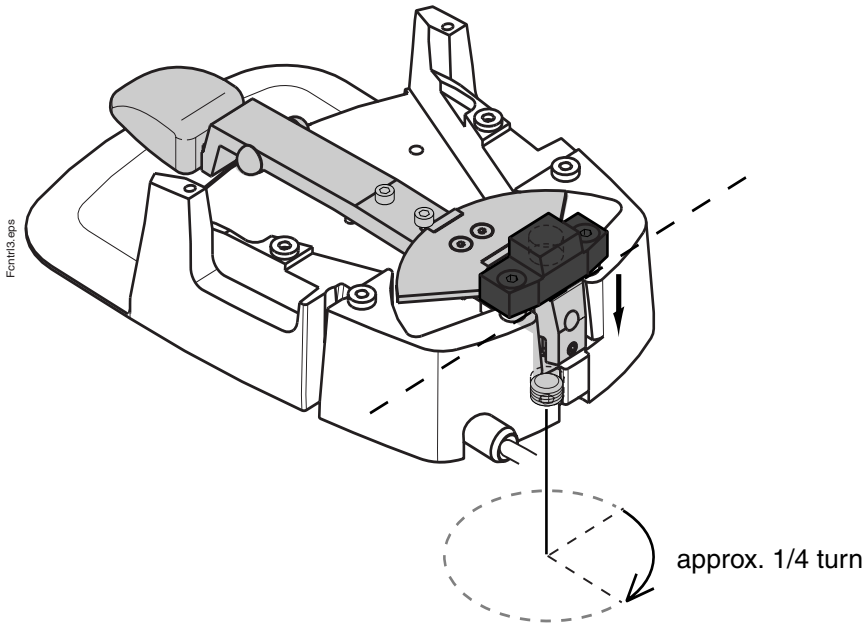
a) Remove the foot control cover as described in section “Removing foot control cover” on page H-1.

b) Remove the foot control PCB as described in section “Replacing foot control PCB” on page H-3.

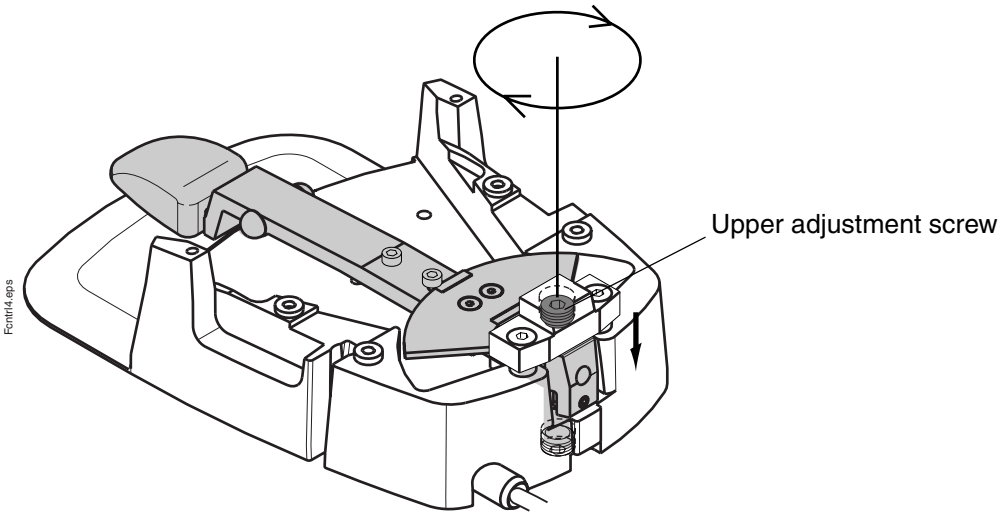
c) Apply a drop of Loctite 243 sealer (or corresponding) to the pedal height adjustment screw. Do not allow Locktite to get to the pedal axle. Tighten the pedal height adjustment screw until the spring washer located above the foot control pedal is flattened against the bearing bar and the foot control pedal touched the bearing bar.



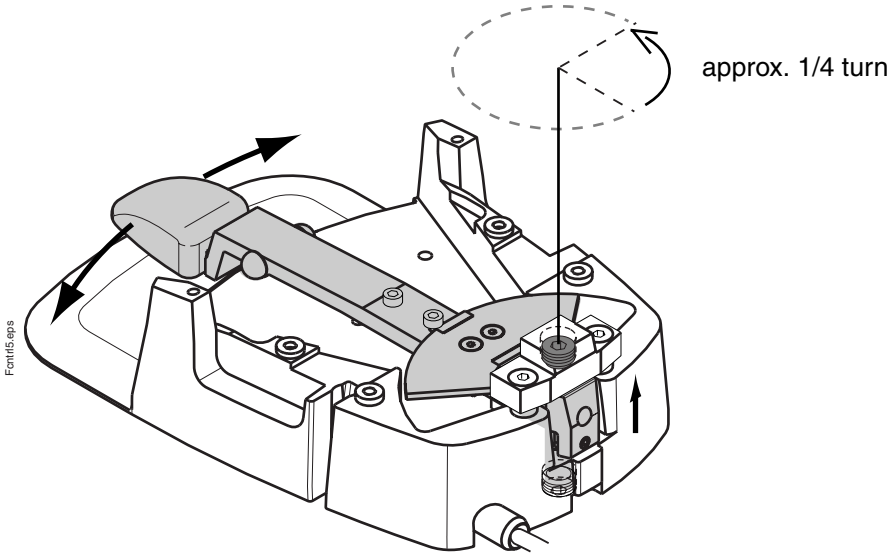
d) Loosen the pedal height adjustment on the underside of the foot control approx. 1/4 turn.



e) Apply a drop of Loctite 243 sealer (or corresponding) to the upper adjustment screw. Do not allow Locktite to get to the pedal axle. Tighten the upper adjustment screw completely (the foot control pedal does not move freely).



f) Then loosen the upper adjustment screw approx. 1/4 turn so that the foot control pedal can move freely.



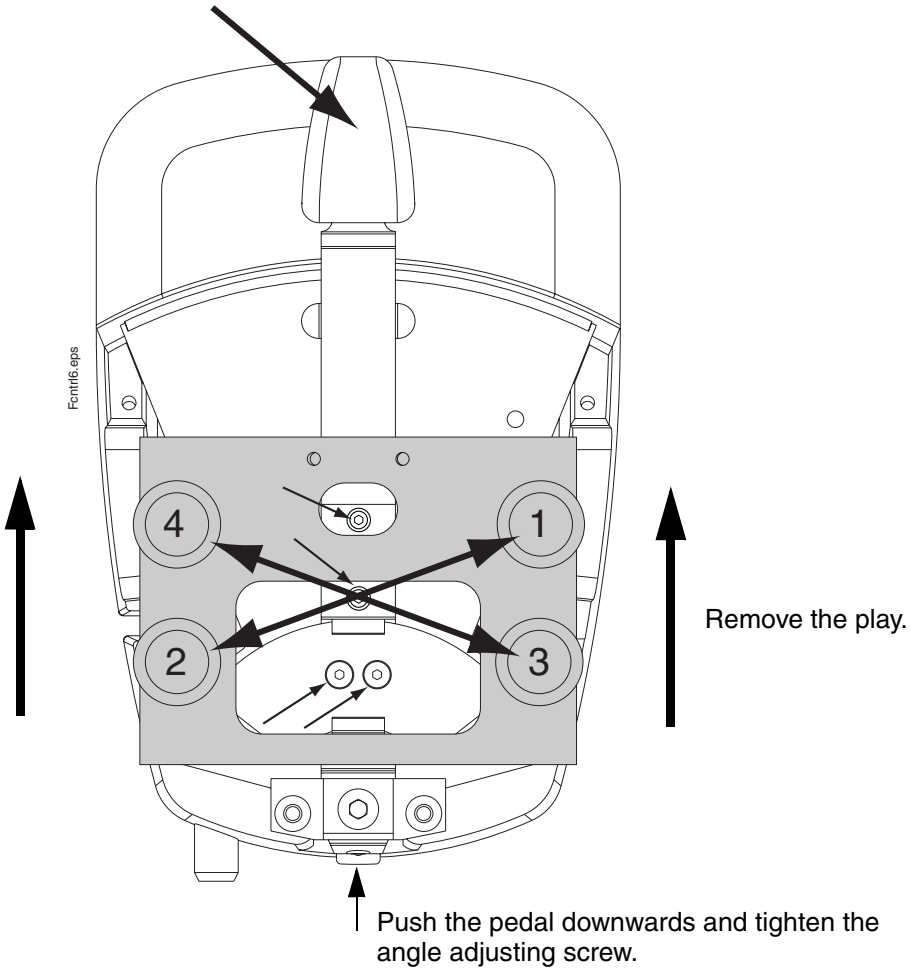
g) Push the foot control pedal downwards and lock it to this position as follows. Tighten the angle adjusting screw located on the back of the pedal arm first completely and then loosen the screw 1/4 turn (see figure on page H-15).

h) Check that the screws of the sector plate and pedal centering plate are loose.

i) Place the foot control calibration tool over the foot control so that the attachment screws go into the Foot control PCB attachment holes. Remove the play of the calibration tool attachment by pushing the calibration tool towards pedal end as shown on the figure below. Make sure that the calibration tool is not tilted.

j) Tighten the attachment screws gradually as follows. First tighten the screws number one and two slightly and then screws three and four, and then again screws one and two etc. until the screws are completely tightened.

k) Release the pedal from the lower position by loosening the angle adjusting screw.

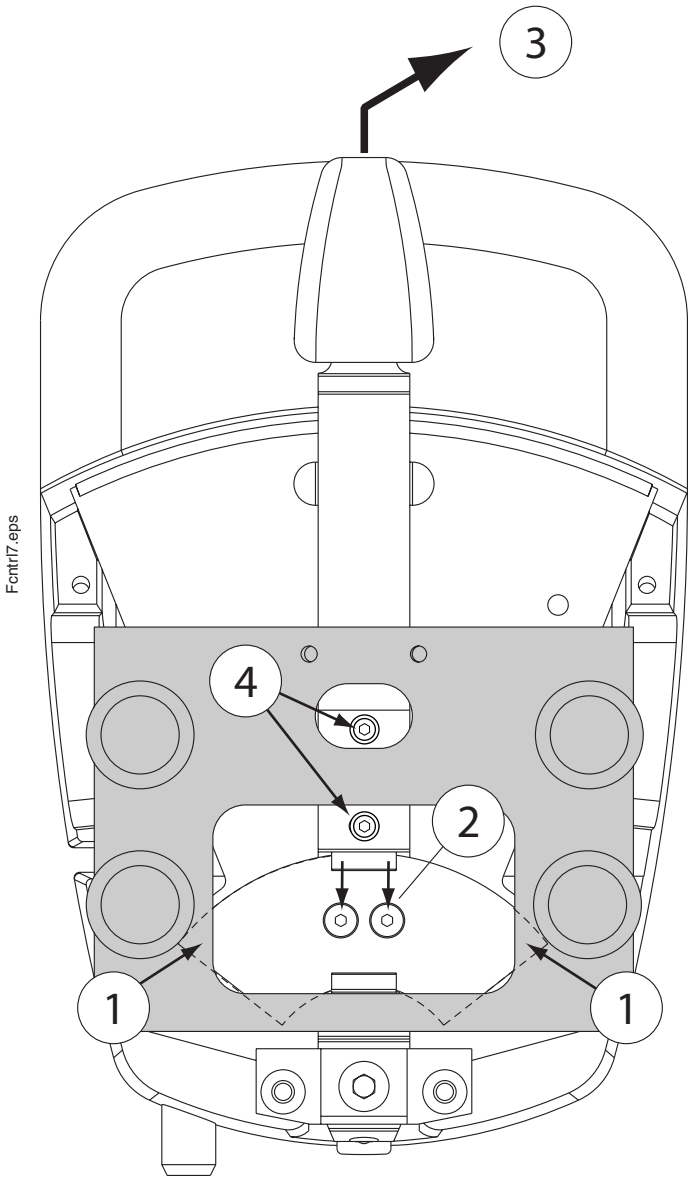


l) Make sure that the sector plate touches the calibration tool (dashed lines on the figure below, 1).

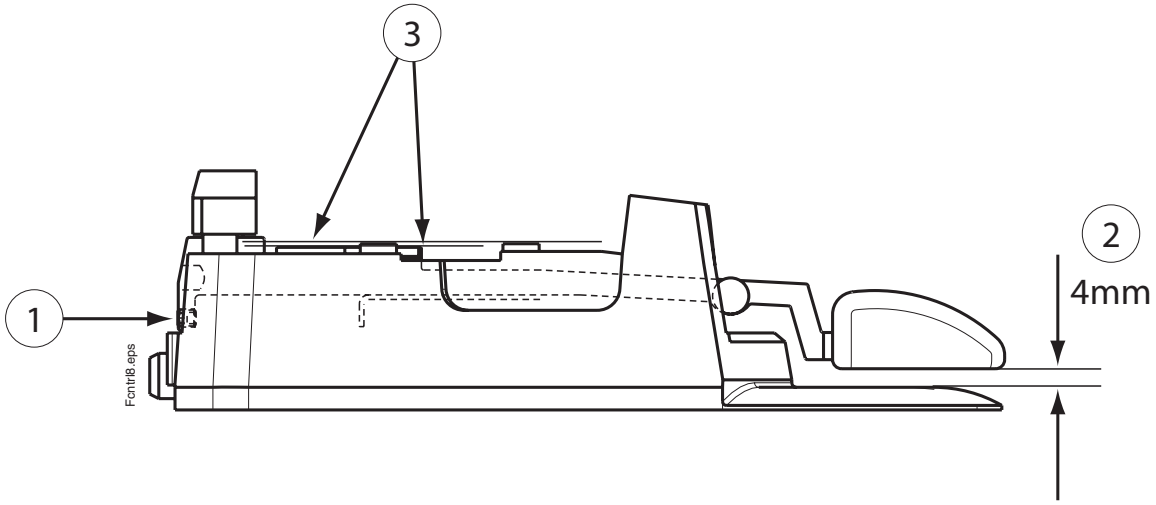
m) Make sure that the screws of the sector plate are in the middle of the sector plate screw holes.

n) Apply a drop of Locktite 242 sealer to the sector plate attachment screws. Tighten the screws equally (2) and simultaneously lift the pedal slightly up so that the sector plate touches firmly the calibration tool (3).

o) Tighten the pedal centering plate screws (4).



p) Adjust the angle of the pedal by tightening/loosening the angle adjusting screw (1). The front end of the pedal should move approx. 4 mm vertically (up/down) for convenient use of the foot control (2). If the pedal is tilted too much, the front end of the pedal's sector plate could touch the foot control PCB (3) and damage it quickly.



q) Reassemble the foot control in reverse order.

r) Calibrate the foot control as described in section "Calibrating foot control" on page H-15.

2.6 Calibrating foot control

The principle of the calibration of the foot control is that there are six pedal positions that need to be determined (left down/up, center down/up and right down/up). Hold the foot control pedal in the desired position and determine the position by moving the chair control to any direction (direction "chair up" (C) recommended).

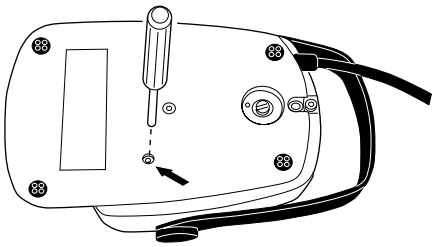
The order in which the six positions are determined is irrelevant. However, the unit suggests the calibration to be done in the same order as demonstrated in this section by showing the next pedal position to determine on the display. In the case that the pedal positions are determined in any other order, the unit shows the undetermined pedal positions on the display. Furthermore, any pedal position already determined, can be determined again without confusing the unit.

In the case that the foot control calibration fails for some reason, an error code will be displayed after exiting the foot control calibration mode.

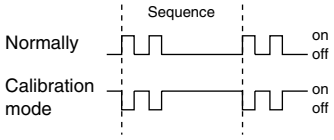
Entering and exiting the foot control calibration mode

a) To enter the foot control calibration mode, insert a screwdriver through the opening at the bottom of the foot control. Press and hold down the calibration switch with the screwdriver for 4 seconds. The blinking sequence of the indicator light inside the foot control cover alters and the first pedal position to determine is suggested on the display.

b) To exit the foot control calibration mode, press the calibration switch briefly with the screwdriver. The blinking sequence of the indicator light inside the foot control cover alters.



BLINKING SEQUENCE OF THE INDICATOR LIGHT

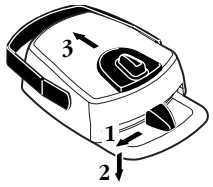


The unit suggests the first pedal position to determine on the display (left down).

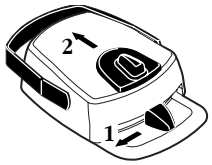
Calibrating the foot control

a) Enter foot control calibration mode.

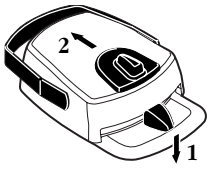
b) Move the foot control pedal to the leftmost position. Press the pedal down and hold. While holding, move the chair control briefly to the ‘chair up’ direction. Release the foot control pedal.



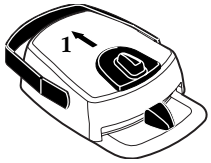
c) Move the foot control pedal to the leftmost position and hold. While holding, move the chair control briefly to the ‘chair up’ direction. Release the foot control pedal.



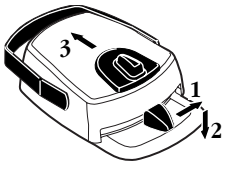
d) Press the foot control pedal downwards and hold. While holding, move the chair control briefly to the ‘chair up’ direction. Release the foot control pedal.



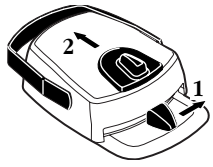
e) Remain the foot control pedal at the center position. Move the chair control briefly to the ‘chair up’ direction.



f) Move the foot control pedal to the rightmost position. Press the pedal down and hold. While holding, move the chair control briefly to the ‘chair up’ direction. Release the foot control pedal.



g) Move the foot control pedal to the rightmost position and hold. While holding, move the chair control briefly to the ‘chair up’ direction. Release the foot control pedal.



h) Exit foot control calibration mode.

2.7 Adjustments and functional check-ups after parts replacements

- Center the foot control pedal by adjusting the position of the pedal centering plate. (See page H-7.)

- Eliminate the horizontal play of the pedal by slightly turning the adjusting rod from the underside of the foot control. (See page H-8.)

- Adjust the tension and angle of the pedal by tightening/loosening the tension adjusting screw and the angle adjusting screw. (See page H-9.)

- Adjust the height of the pedal in a way that the air gap between pedal's sector plate and the foot control PCB is 0,5-1mm. (See page H-11.)

- Calibrate the foot control. (See page H-15.)

  In case of error (if re-calibration does not help):

ERROR MESSAGE	REMEDY
E54.1 or E54.2	replace the foot control PCB
E54.3 ... E54.7	re-adjust the air gap between pedal's sector plate and PCB re-adjust the horizontality of the pedal's sector plate
E54.8	re-adjust the air gap between pedal's sector plate and PCB replace the foot control PCB

- Check the chair control signals in the service mode #61
  the four last segments refer to the positions A, B, C and D

- Check the pedal horizontal coordinate in the service mode #62
  when pedal is in center position, the display must show "0"
  when pedal moved fully right or left, the display must show +-255
  pedal must be able to be moved 5mm from max. before the display changes from +-255

- Check the pedal vertical coordinate in the service mode #63
  when pedal is in rest, the display must show 50...70
  when pedal is pressed down, the display must show -50...-70

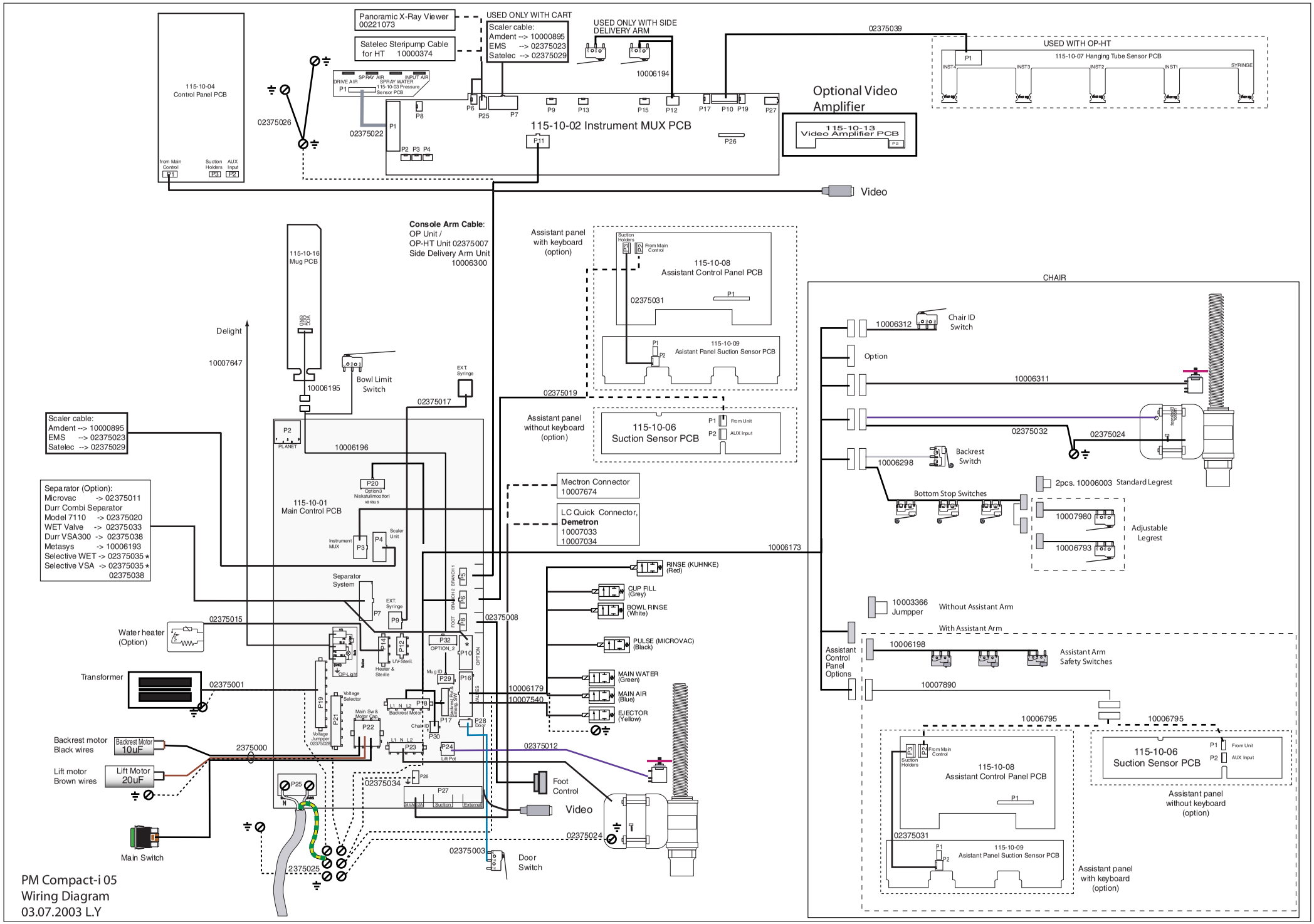
- Check the signal level of the capacitance sector A in the service mode #64
  when the pedal is in rest, the display must show 3000...7000
  (<3000 = air gap too big, >7000 = air gap too small)
  when the pedal is fully right or left, the display must differ at least +-600
  if not, air gap too big or pedal's sector plate is tilted

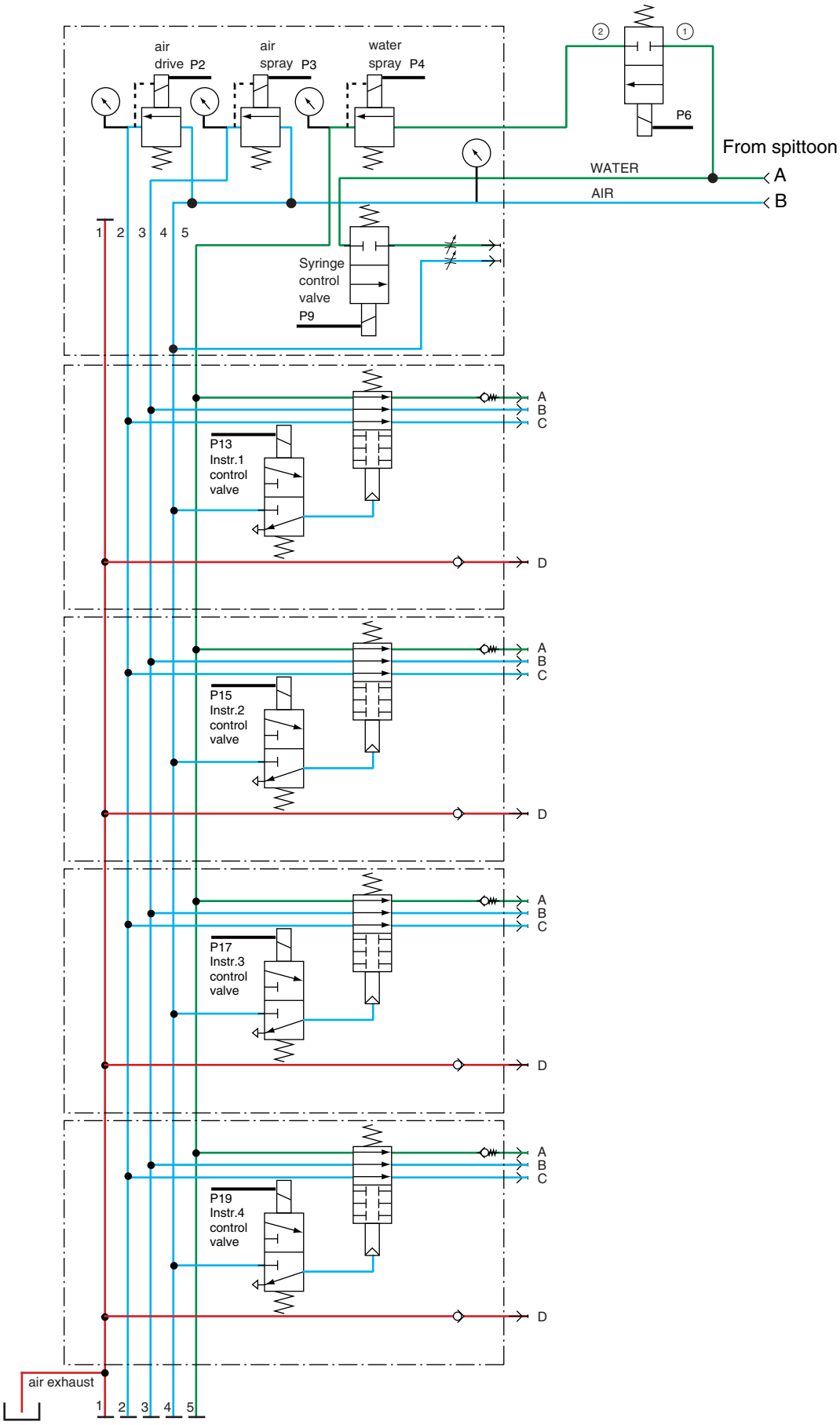
- Check the signal level of the capacitance sector B in the service mode #65
  the display must not differ more than +-300 from the above when the pedal is in rest
  if more, the pedal's sector plate is tilted
  when the pedal is fully right or left, the display must differ at least +-600
  if not, air gap too big or pedal's sector plate is tilted

Chapter

I

DIAGRAMS


Panoramic X-Ray Viewer
00221073
Satelec Steripump Cable
for HT 10000374
USED ONLY WITH CART
Scaler cable:
Amdent --> 10000895
EMS --> 02375023
Satelec --> 02375029
USED ONLY WITH SIDE DELIVERY ARM
10006194
02375039
USED WITH OP-HT
115-10-07 Hanging Tube Sensor PCB
115-10-04
Control Panel PCB
02375026
02375022
115-10-02 Instrument MUX PCB
Optional Video Amplifier
115-10-13
Video Amplifier PCB
Video
Console Arm Cable:
OP Unit /
OP-HT Unit 02375007
Side Delivery Arm Unit
10006300
115-10-16
Mug PCB
Assistant panel with keyboard (option)
115-10-08
Assistant Control Panel PCB
02375031
115-10-09
Asistant Panel Suction Sensor PCB
02375019
Assistant panel without keyboard (option)
115-10-06
Suction Sensor PCB
CHAIR
10006312
Chair ID Switch
Option
10006311
02375032
02375024
10006298
Backrest Switch
Bottom Stop Switches
2pcs. 10006003 Standard Legrest
10007980
10006793
Adjustable Legrest
Delight
10007647
10006195
Bowl Limit Switch
EXT. Syringe
02375017
10006196
Scaler cable:
Amdent --> 10000895
EMS --> 02375023
Satelec --> 02375029
Separator (Option):
Microvac -> 02375011
Durr Combi Separator
Model 7110 -> 02375020
WET Valve -> 02375033
Durr VSA300 -> 02375038
Metasys -> 10006193
Selective WET -> 02375035 *
Selective VSA -> 02375035 *
02375038
115-10-01
Main Control PCB
Mectron Connector
10007674
LC Quick Connector,
Demetron
10007033
10007034
10006173
Separator System
RINSE (KUHNKE) (Red)
CUP FILL (Grey)
BOWL RINSE (White)
PULSE (MICROVAC) (Black)
MAIN WATER (Green)
MAIN AIR (Blue)
EJECTOR (Yellow)
02375008
10006179
10007540
Water heater (Option)
02375015
Transformer
02375001
Backrest motor Black wires
Backrest Motor 10uF
Lift motor Brown wires
Lift Motor 20uF
2375000
02375012
Foot Control
Video
02375034
02375024
02375003
Door Switch
Main Switch
2375025
10003366 Jumpper
Without Assistant Arm
With Assistant Arm
Assistant Control Panel Options
10006198
Assistant Arm Safety Switches
10007890
10006795
10006795
115-10-08
Assistant Control Panel PCB
02375031
115-10-09
Asistant Panel Suction Sensor PCB
Assistant panel with keyboard (option)
115-10-06
Suction Sensor PCB
Assistant panel without keyboard (option)
PM Compact-i 05
Wiring Diagram
03.07.2003 L.Y



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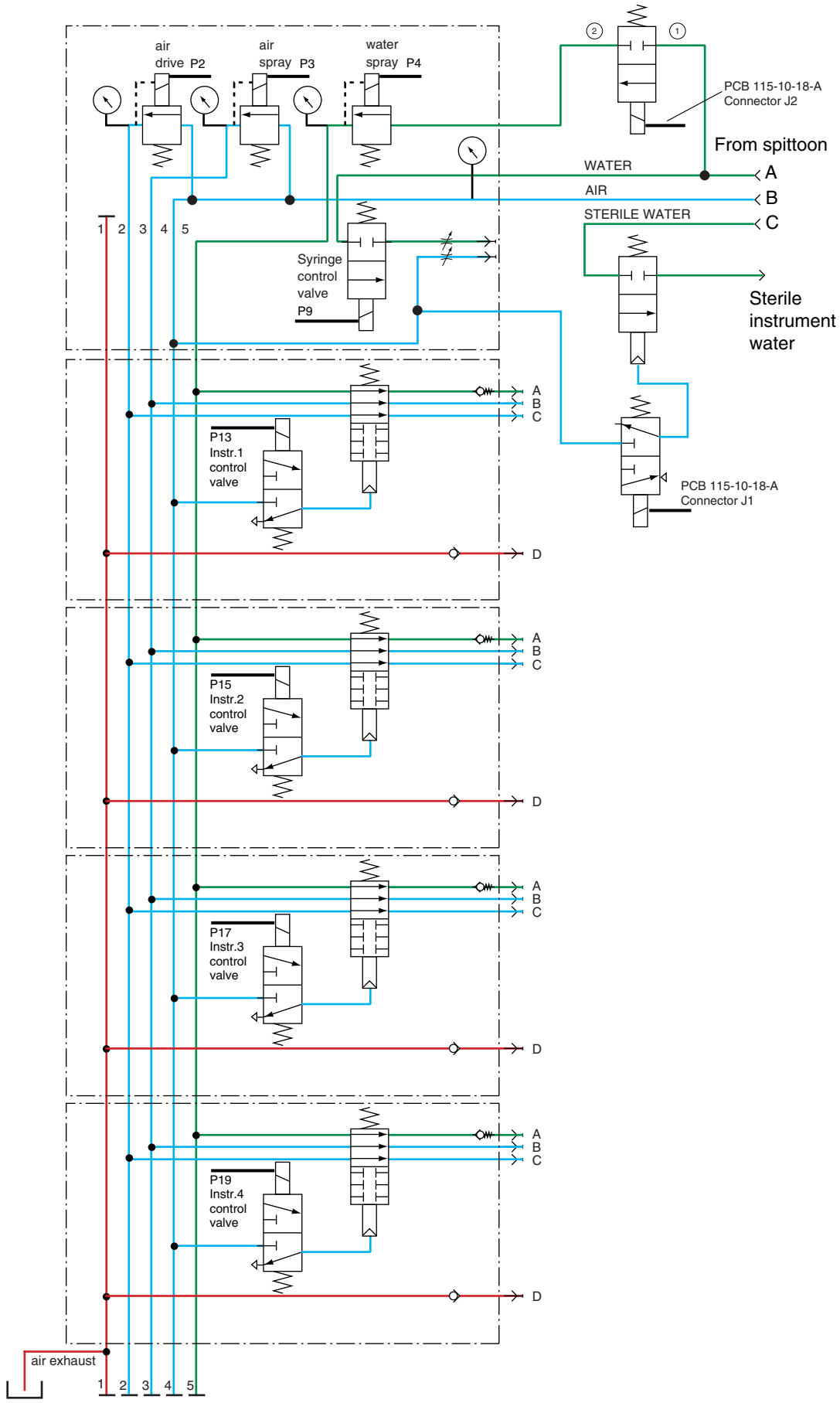
Date 05.02.2003	PNEUMATICAL DIAGRAM
Designed P.Peräsaari / M.Jarva	PLANMECA COMPACT instrument console
Drawn S.Jänkävaara	
Checked P.Peräsaari / M.Jarva	Rev.D



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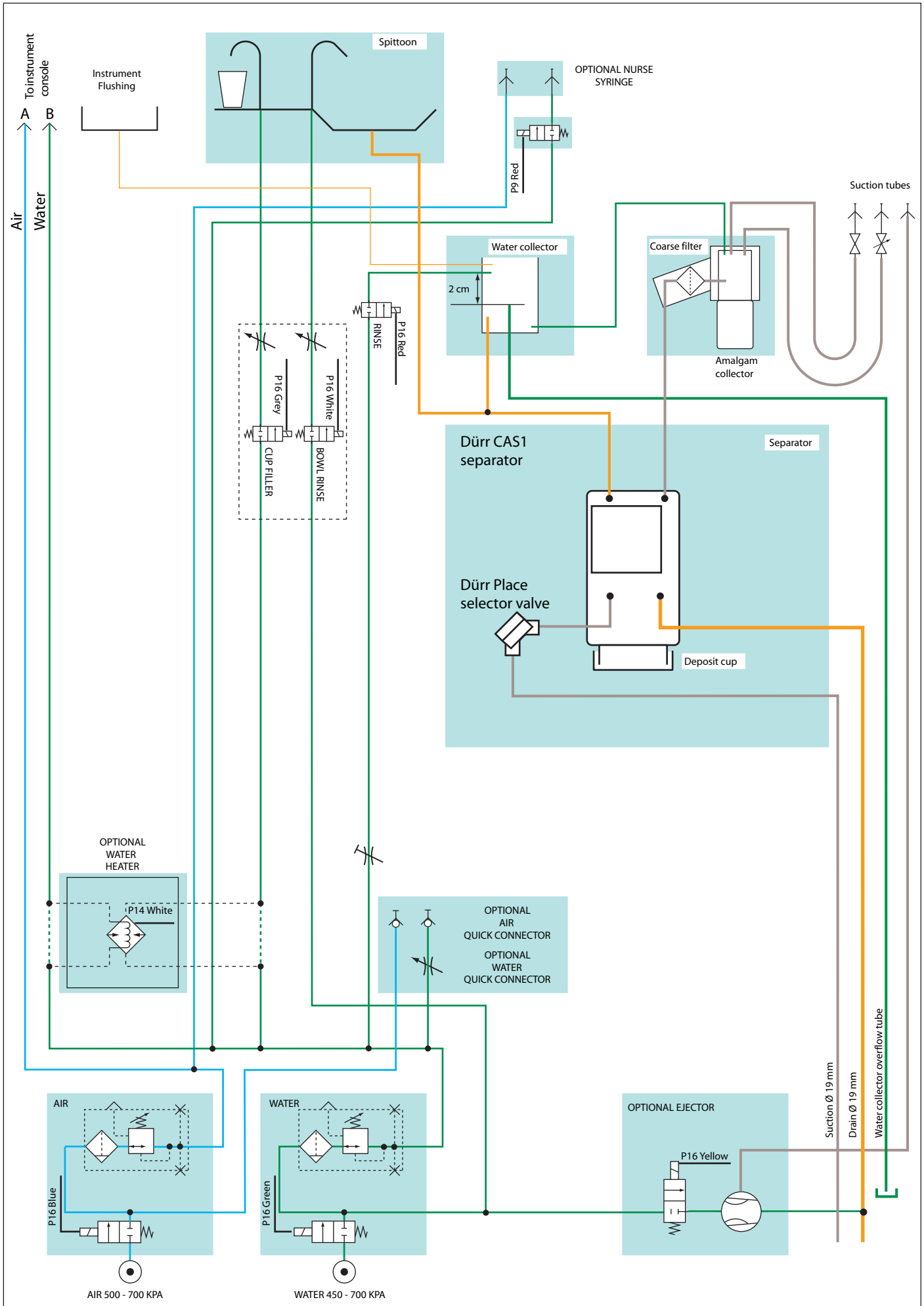
Date 05.02.2003	PNEUMATICAL DIAGRAM
Designed P.Peräsaari / M.Jarva	PLANMECA COMPACT instrument console with Sterile Water System
Drawn S.Jänkävaara	
Checked P.Peräsaari / M.Jarva	Rev.D



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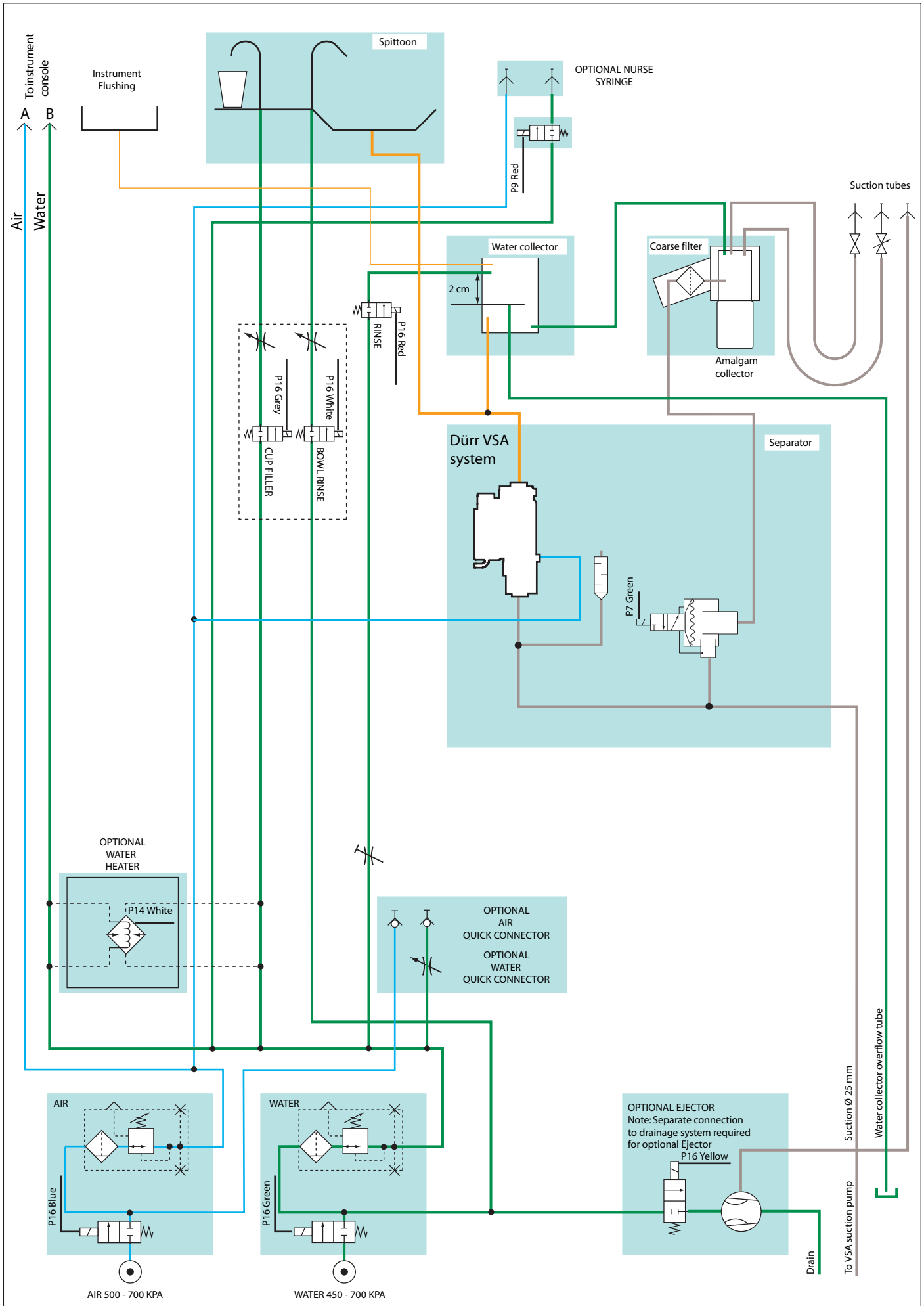
Date 27.10.2004	PNEUMATICAL DIAGRAM	
Designed J.Fröjdman	PLANMECA COMPACT with Dürr CAS1 amalgam separating system	
Drawn S.Jänkävaara		
Checked J.Fröjdman	Rev.C	



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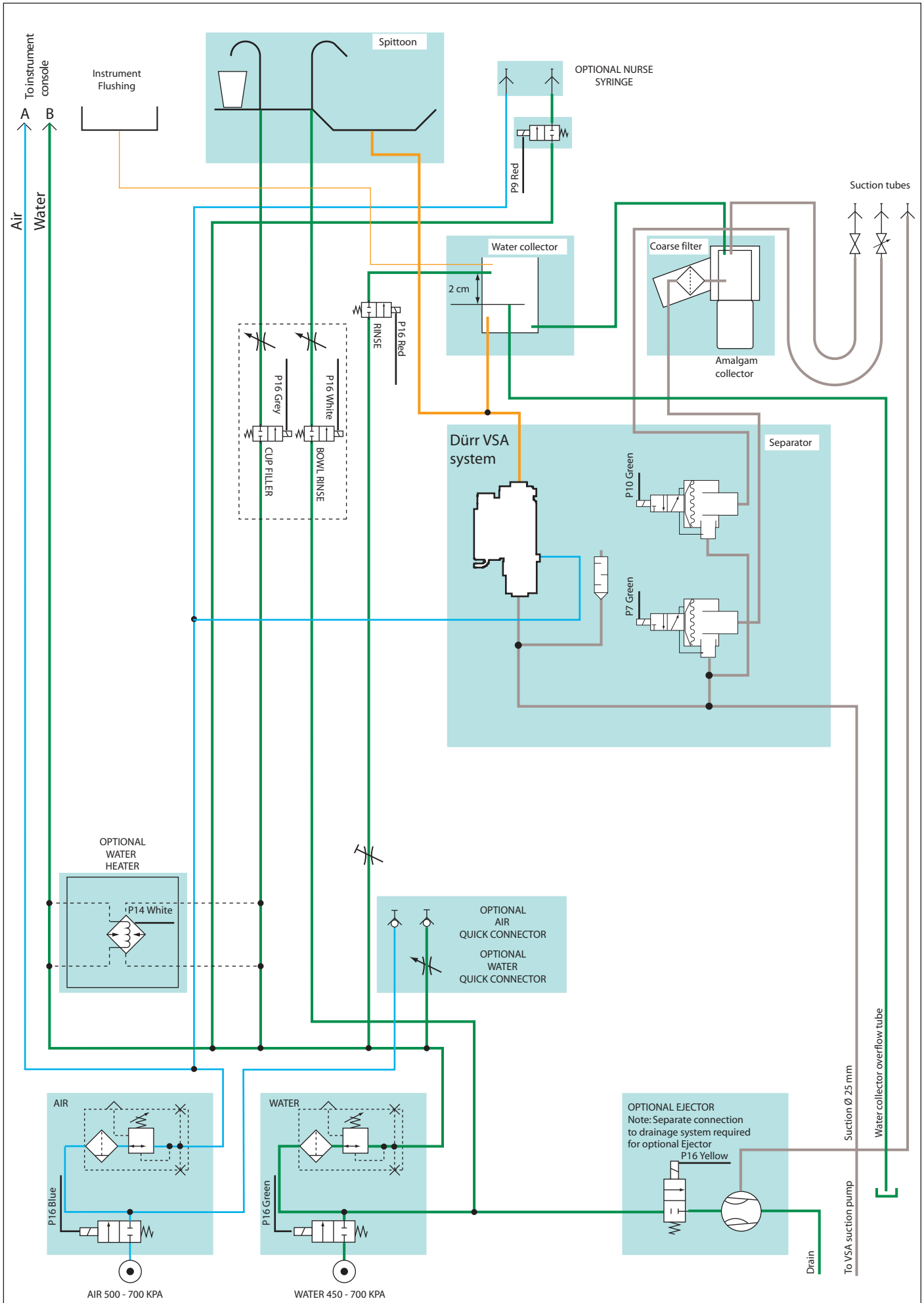
Date 03.05.2004	PNEUMATICAL DIAGRAM	
Designed J.Fröjdman	PLANMECA COMPACT with Dürr VSA system	
Drawn S.Jänkävaara		
Checked J.Fröjdman	Rev.B	



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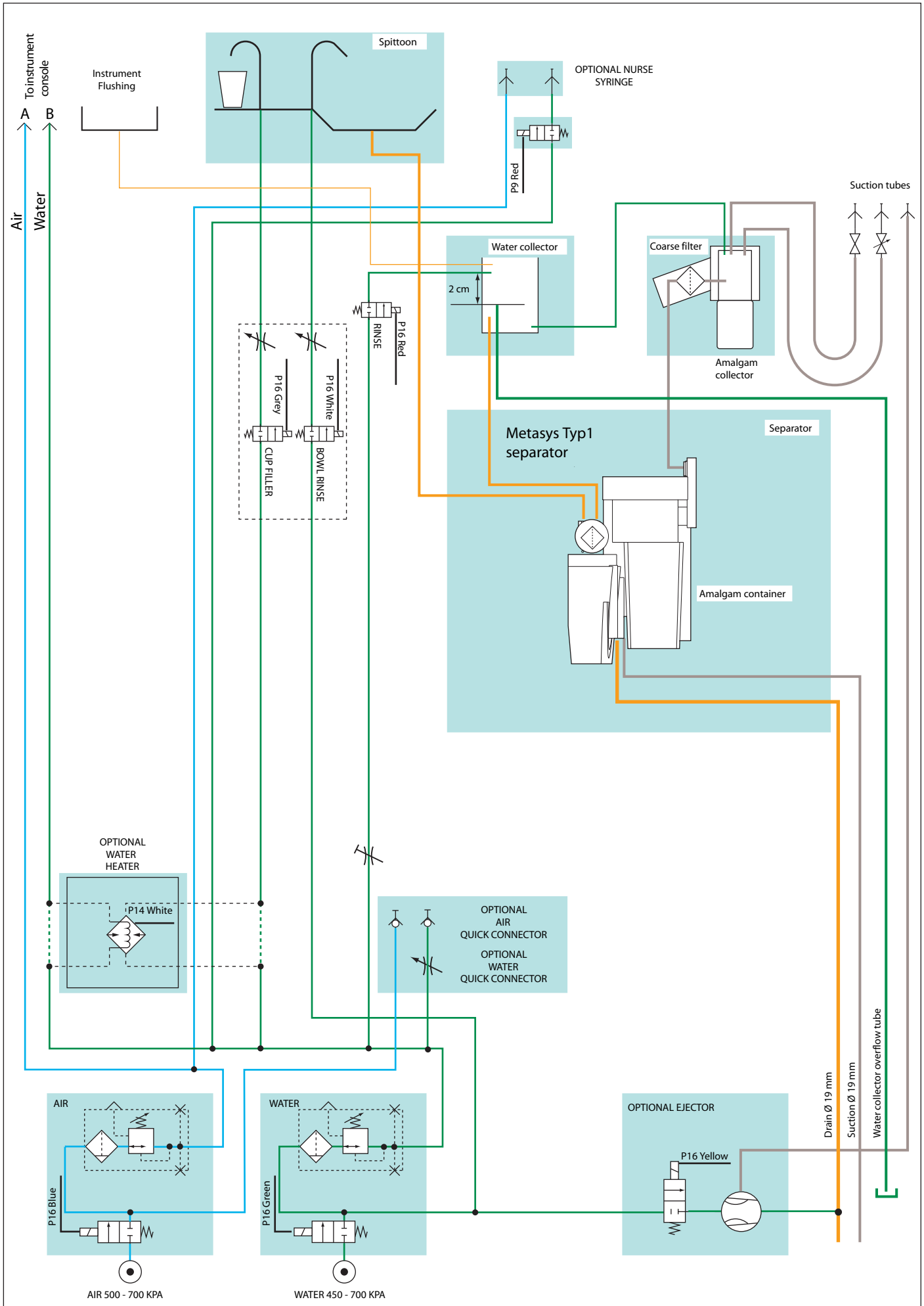
Date 03.05.2004	PNEUMATICAL DIAGRAM	
Designed J.Fröjdman	PLANMECA COMPACT Selective suction system VSA	
Drawn S.Jänkävaara		
Checked J.Fröjdman	Rev.B	



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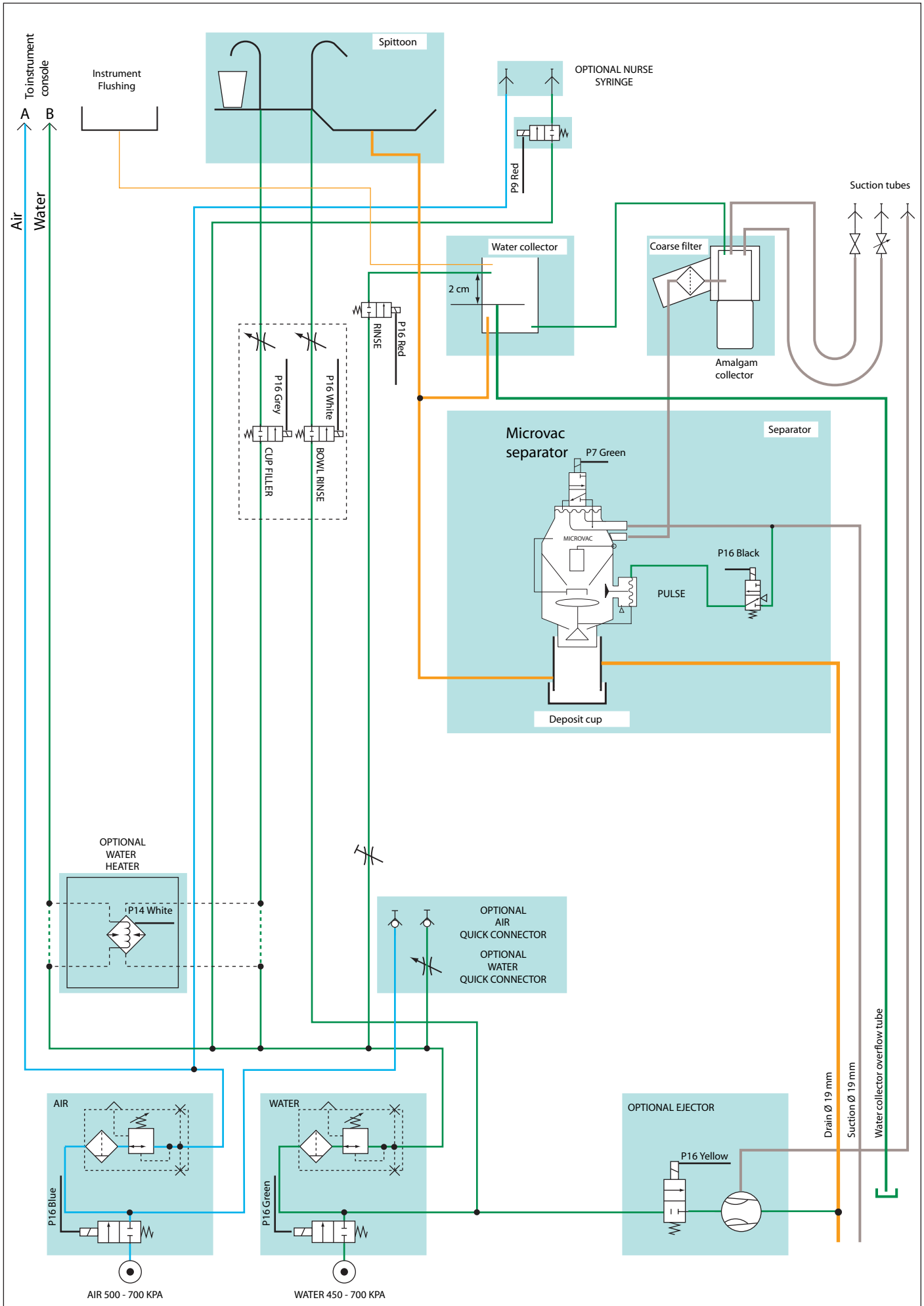
	Date 27.10.2004	PNEUMATICAL DIAGRAM
	Designed J.Fröjdman	PLANMECA COMPACT with Metasys Typ1 amalgam separating system
	Drawn S.Jänkävaara	
	Checked J.Fröjdman	Rev.C



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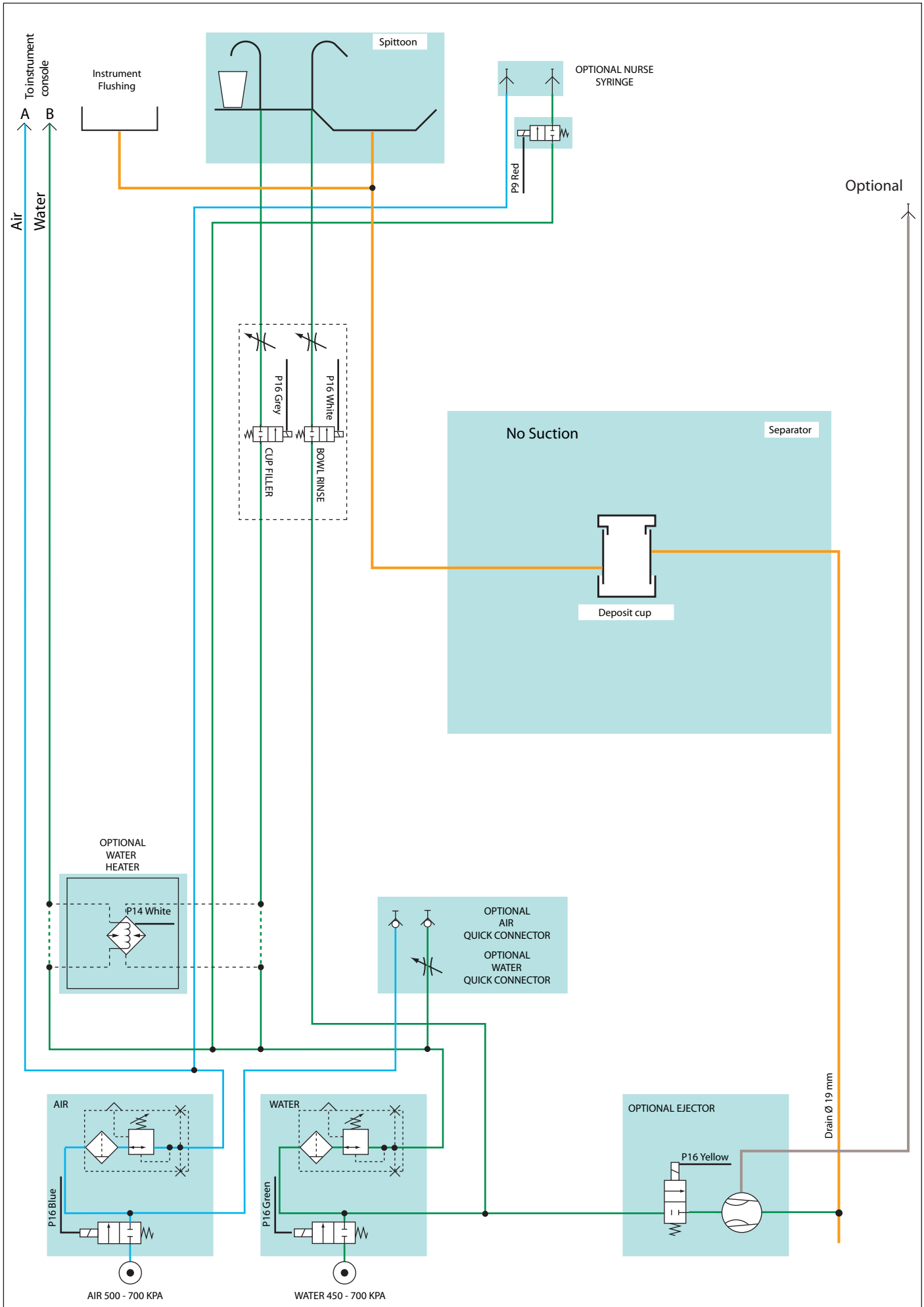
Date 27.10.2004	PNEUMATICAL DIAGRAM	
Designed J.Fröjdman	PLANMECA COMPACT with Microvac amalgam separating system	
Drawn S.Jänkävaara		
Checked J.Fröjdman	Rev.C	



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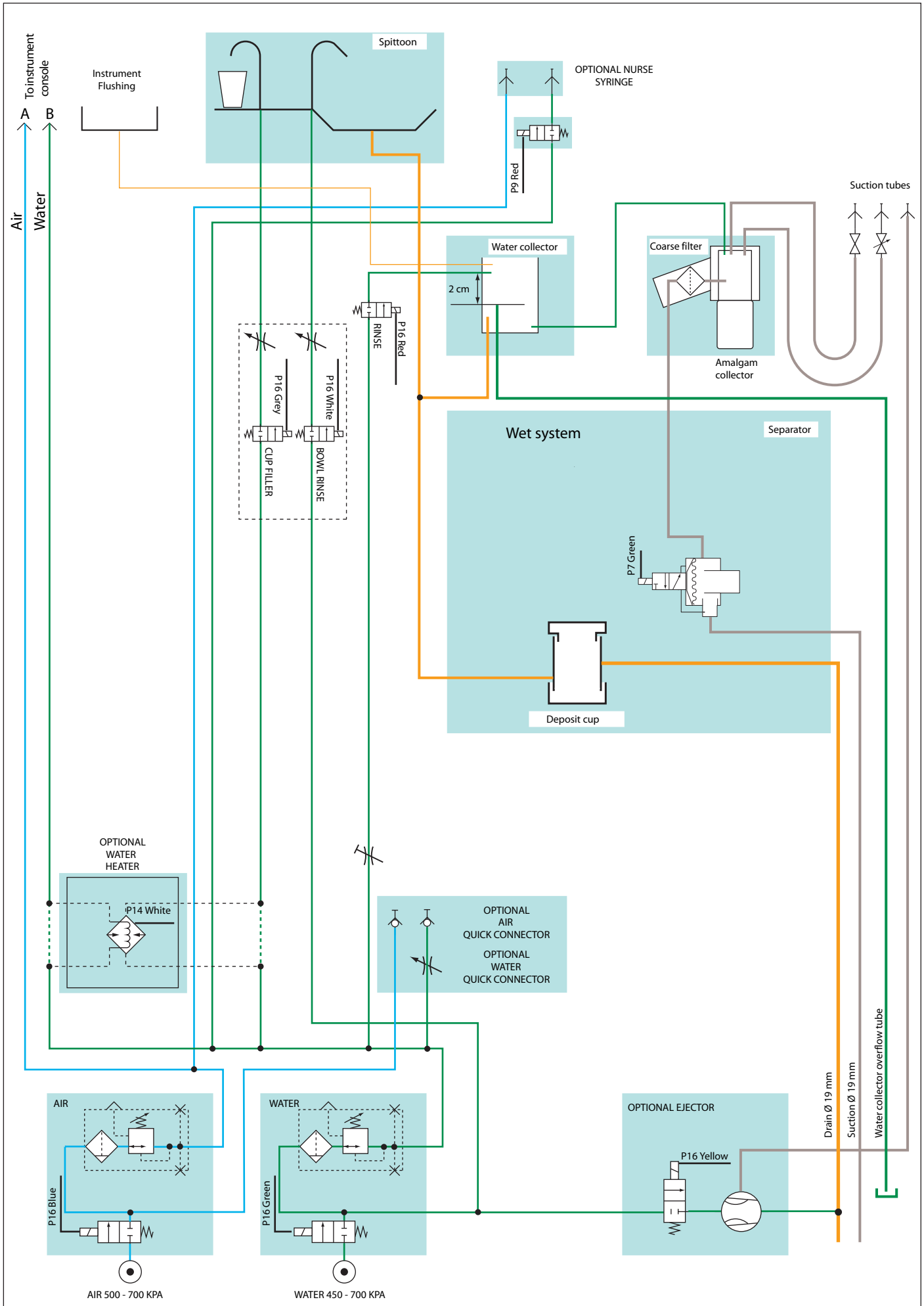
	Date 27.10.2004	PNEUMATICAL DIAGRAM
	Designed J.Fröjdman	PLANMECA COMPACT No suction system
	Drawn S.Jänkävaara	
	Checked J.Fröjdman	Rev.C



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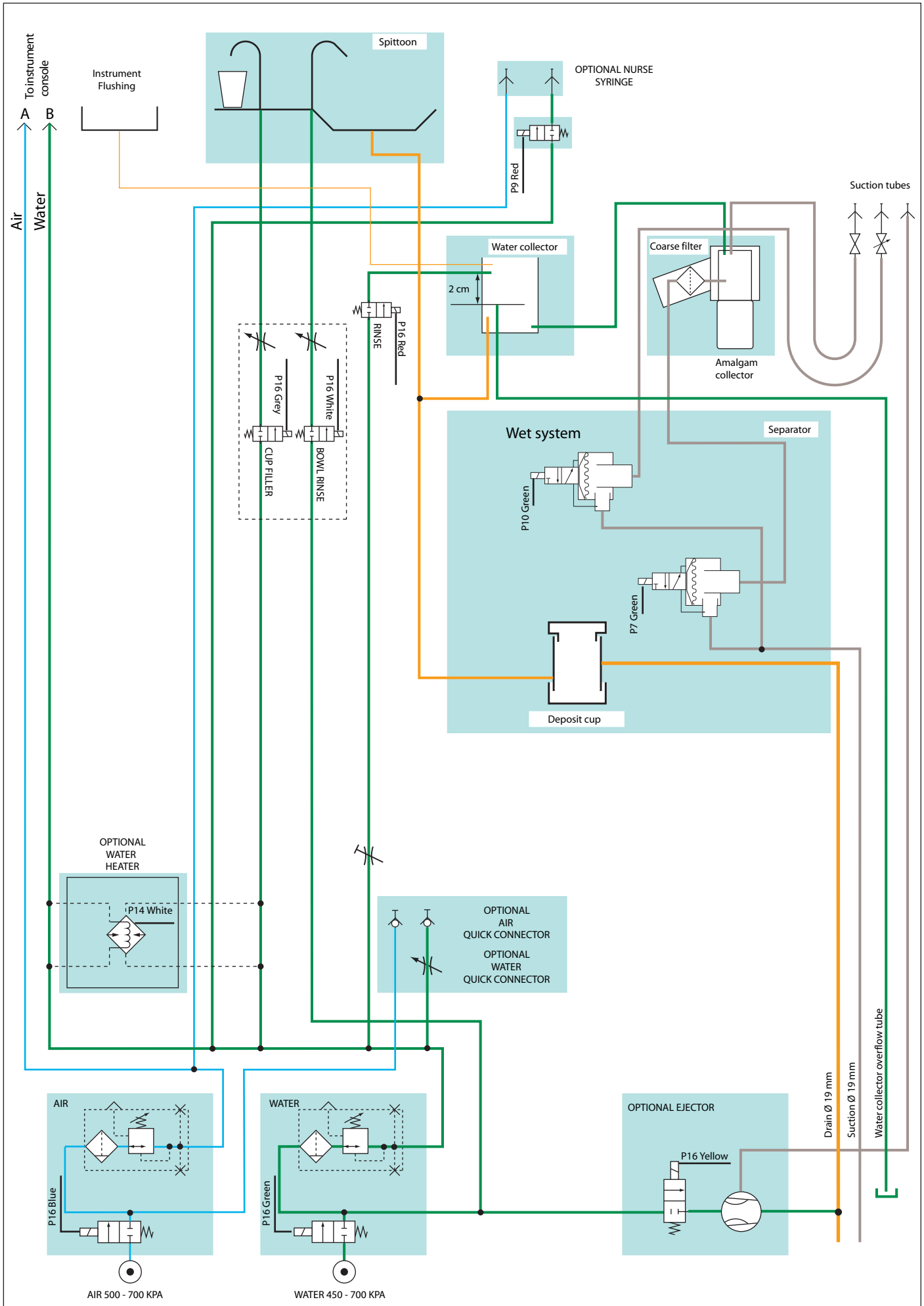
Date 27.10.2004	PNEUMATICAL DIAGRAM	
Designed J.Fröjdman	PLANMECA COMPACT Wet suction system	
Drawn S.Jänkävaara		
Checked J.Fröjdman	Rev.C	



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	Date 27.10.2004	PNEUMATICAL DIAGRAM
	Designed J.Fröjdman	PLANMECA COMPACT Selective suction system Wet
	Drawn S.Jänkävaara	
	Checked J.Fröjdman	Rev.C

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